FLIGHT

First Aero Weekly in the World.

Founder and Editor: STANLEY SPOONER.

A Journal devoted to the Interests, Practice and Progress of Aerial Locomotion and Transport.

OFFICIAL ORGAN OF THE ROYAL AERO CLUB OF THE UNITED KINGDOM.

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Flight.

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CONTENTS.

EDITORIAL COMMENT.

WE have noticed recently, not with any great surprise, be it said, that financial journals are beginning to manifest quite a fatherly interest in the future of aviation. Certain of the City scribes have indulged in much prophecy regarding the future of the movement, some of which is more remarkable for what we should almost term poetic licence than for reasoned opinion. There must be a reason for this sudden access of affection for an industry which had not a great deal to thank financial circles for in the days of its struggling youth. That reason is not very far to seek, and when we realise what is behind the interest it is a very sordid reason indeed. The war has lifted the aircraft industry from the ranks of the unestablished and has placed it upon a firm and sure foundation. It is no longer a speculative business with an indeterminate future. Therefore, the wild cat company promoter has his eyes upon it as one of the milch cows of "after the war." For the past two and a half years these gentry must have had a particularly bad time, but although we have heard little or nothing of them since the war put a stop to their operations, it must not be supposed that the genus is altogether extinct. On the contrary, a long period of hunger has but sharpened their appetites, and by this time they are as ravenous as wolves for the prey that they believe awaits the swallowing process when at last the coming of peace will set them free to pursue their crooked ways again. Forewarned is forearmed, and the industry at large will do well to keep an eye upon the company-promoting schemes that are already in the air and are sure to be sprung upon the public at the end of the war. We are not in any way including in this category the expansion of legitimate concerns, which have an unimpeachable record behind them, and the investment by the public in which would rather be in the way of a privilege than otherwise. It is a bird of a very different plumage to which we take objection well in advance.

Sowing the Seed!

We do not want any repetition of the history of the early days of the motor trade in this country, when a promising industry was nearly stifled in its infancy by the operations of a gang of "financiers." The story of those early days is not one that is pleasant to look back upon.

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"The Comb."

Following upon our comments of last week, on the subject of the proper utilisation of our man-power, the moral of our remarks is very well pointed by a case which was heard by the London Appeal Tribunal the other day. The case in point was one in which a highly qualified surveyor, passed B2, had been given temporary exemption in order that he might obtain work of national importance. According to the story he told the Tribunal, he had made application to several Government departments, but none of them apparently had any use for his services. After being turned down several times, he went to the Hotel Cecil, where he succeeded in securing interviews with a private and a sergeant! Ultimately he managed to get the ear of an officer, who consoled him with the information that if 300 jobs were open they usually had 3,000 applicants for them. And so he got no farther forward in his effort to effectively serve his country!

We do not wonder that Mr. Donald Maclean, M.P., the chairman of the Tribunal, made some rather strong remarks on the case. The worst of it is that, bad as it seems on the face of it, this is only an example of what is going on all around us. If we were able to make a selective census of all the people who are at the present moment occupying Government appointments, we should find that nine-tenths of them

fitted the definition of the round peg in the square hole. It is bound to be so under a system in which it counts for far more to have a friend at court than to possess the highest possible qualifications for the particular post that happens to be going. It is not only that what the Far Eastern calls "friend-pidgin" counts for far too much, but that the whole want of system is dead wrong. True, we have had to improvise a vast machinery for the conduct of the war, and where hasty improvisation is the order of the day mistakes are inevitable. But even so, it might have been thought that the first thing necessary to successful improvisation was what we must call, for want of a better term, the establishment of a clearing house for brains. We made no end of fuss about National Registration. It was going to place the authorities in possession of all the information necessary to fit every man and woman in the country into his or her proper place in the scheme of things. It had the makings of the "clearing house" as we visualise it, but it has not worked to that end at all. Instead, we see every day of our lives men being taken for the Army who would be of incalculably greater use in some civilian capacity, and men being fitted into civilian jobs who have no business anywhere but in the fighting forces of the Crown. To our way of thinking, the mess and muddle that have characterised the administration of the Military Service Act and the Munitions of War Act have been by far the most deplorable aspects of the war. It says very little for our national efficiency that we cannot manage better than we do.

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The Postal Aeroplane.

When we fell into prophetic vein last week, and foresaw with the mind's eye our postal and passenger public services being conducted by means of aircraft, we scarcely thought that within a week we should receive the first object-lesson in the correctness of our forecast. True, that object-lesson is only in a small way, but it is nevertheless there to point the moral—if not to adorn the tale. We read that the United States Government has just entered into a firm contract, in consideration of an annual sum, for the carriage by aeroplane of mails and passengers between Nome, on the Alaskan coast, and a point 381 miles inland. Under the contract, two trips a week are to be made, and the service will bring the interior of Alaska *three weeks nearer* the outside world than it has been in the past. Apparently, the service will meet with considerable difficulties, since the country which has to be traversed is mountainous and there are no level tracts on which a landing could be made in case of necessity. Moreover, we are told that the snow in winter lies from 25 to 30 feet deep over the whole country, so that even if an intermediate landing were made, there would be very serious difficulties in the way of the machine getting off again. However, the contractor seems to be sanguine of his ability to comply with the terms of his arrangement with the postal authorities, and has already made a successful trial trip, carrying four passengers. The principal point that strikes us in connection with this, the first regular contract of the kind that has been made, is the wonderful saving of time effected by the use of the aeroplane. Three weeks saved over a distance of less than four hundred miles is an eloquent pointer of the possibilities of aircraft in reaching the less accessible parts of the world. And if such a service as this can save so much time in Alaska, and over so short a distance, what then would be the saving of time in working postal aeroplanes from, say, the Eastern coast of Africa to the remoter settlements a thousand miles inland, to which the only present access is by bush tracks? Comparatively small as the enterprise which forms our test may be, it gives a great deal of food for thought for the future. There are those who argue that after the war there will be a slump in aircraft—that the demands of Governments for aeroplanes will practically cease and with them the only market. The answer to that argument is in part given by the initiation of this tiny enterprise in the far north of the American continent. It requires very little imagination to realise that this is only the pioneer of a thousand such enterprises.

Beyond this concrete example of the use of the aeroplane for the purposes of the mails, the French Government is engaged in a discussion of the possibilities of making use of an aeronautical service commercially after the war, especially for the national and international postage services. A Committee of the Minister of Commerce has been appointed, whose terms of reference are defined thus:—

"To promote advances in aeronautics, and with this object to contribute in peace towards the development of the aviation industry that originated with the war, and that constitutes a form of national work, and further to exploit the advances made for spreading the influence of the French genius. The special problems that in the view of the Committee demand an early solution are to determine the price of a service per kilometre, the possible utilisation of aeroplanes, the character of the transport service, the practicable routes in France, her Colonies, and Allied countries, the character of the machine that will be most serviceable, and the organisation of stations, relays, &c."

Once again we have an eloquent object-lesson in the possibilities of the future. Here in the midst of a great war, when all our energies and those of our Allies are being turned to the purposes of the war, we see one of the Great Powers finding time and making opportunity to discuss the future of commercial aeronautics. At least this is an argument that in the eyes of responsible Governments aeronautics has well emerged from its experimental stages.

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The Growth of Bureaucracy.

We scarcely feel that any apology is due for our periodical wanderings outside the scope of those interests to which FLIGHT is primarily devoted. In times like these it is due by every organ of opinion that it should assist in the moulding of the larger issues which so intimately concern every one of us, and it is with that conviction that we feel impelled to branch off into the discussion of subjects that, in more normal times, we should be content to leave to others, whose more intimate concern they are.

On several occasions recently we have directed attention to the serious danger that threatens the nation as a result of the rapid growth of bureaucracy, which is throwing out its tentacles in ever-widening directions. We see its reflex in the mania for wild and indiscriminate sequestration of hotels, clubs and ducal mansions for the housing of new and yet more bureaucratic departments of the Government. We see it in the unjust and oppressive interferences with rights and the liberty of the subject which are becoming the delight of the official mind when riding

The Modern Falconers.

Releasing the craft for their quarry.

roughshod over those rights and liberties, under cloak of the Defence of the Realm Act, which gives us very seriously to think that a new era is dawning to which that of the Cromwellian Puritan government was a period of liberty and licence. We are not alone in so thinking, and it is significant of the pass to which we are being brought that the *Times* considers it necessary to utter the self-same warning that has been given in these columns, not once, but many times. In a leading article dealing with the instructions issued by the Kaiser for reform and reduction of the Prussian bureaucracy, the *Times* remarks :—

"Notwithstanding the prospect of a huge indemnity which has been so frequently held out to the German people as the certain fruit of their victory, His Majesty now makes the candid, if disagreeable, confession, that 'public burdens will undergo an extraordinary increase after the war.' He accordingly directs the two experienced officials whom he names to examine seriously how the administrative system may be simplified and its cost reduced. To ensure their independence he gives them and their assistants authority to 'disregard the instructions of their superiors.' The precaution is no doubt most necessary, but will it be efficacious? Departments have long memories and innumerable ways of paying off over-sealous innovators. That, however, is no concern of ours. What does concern us is that our own bureaucracy, now throwing out its tentacles more prolifically than ever, needs the very reforms which the King of the most formidable bureaucracy in the world declares to be indispensable, and that it needs them for the same reasons—and for some others."

We are in the most absolute accord with these last sentences. The cost of multiplication of the Government departments is colossal—and the nation does not get one quarter of its money's worth in return. What is worse is that each new department is invested with powers more autocratic than the last, until we are compelled to wonder if the Government is experimenting to find out exactly how much the nation will stand before something breaks. Of course, the nation does not mind very much now, since it recognises that the Government of the day must be given an open cheque if we are to win the war. It is *after we have won the war* that the danger will come to a head, and it is that which causes the thinking person to look forward to that time with a good deal of misgiving. Really, we are coming to the opinion that the time is not far off when the non-official classes and those who are not in the running for Government employment—those, in a word, who will have to do the paying and obeying—will have to seriously take stock of the future and decide upon what is to be done to get rid of the bureaucratic incubus when once we have done with the war. The movement will most certainly not come from inside—the vested interests will have become too strong. There is never smoke without fire, and in many directions there are already very suggestive remarks, gloatingly, sneeringly or regretfully given vent to, according to individual views, to the effect that "don't worry, *that* building will never be let go back to its former owners," &c. Therefore, it will have to come from outside, and it will have to be a very powerful movement, too, if we are to regain any substantial proportion of our pre-war liberties.

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Calling Up the Youngsters. The decision of the War Cabinet to call up the youths of 18 for home defence appears to be a wise measure, and one that will set free for service overseas numbers of older men who are now being held in the country either as a part of the permanent defences or in the strategic reserve. We are glad to see that it is not the intention to call up lads who have passed through an apprenticeship in any of the skilled engineering trades, and who are now fully engaged in war work in shipyards and munition factories. Those who are not so employed are to be posted as artificers to such units as the R.F.C. and the Machine Gun Corps.

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THE ROLL OF HONOUR.

REPORTED by the Admiralty:—

Missing.

Flight-Com. C. R. Mackenzie, D.S.O., R.N.

Previously reported Killed, now reported a Prisoner of War.

Flight-Com. E. R. Moon, R.N.

Reported by the War Office:—

Killed.

2nd Lieut. J. Hay, R.F.C.
2nd Lieut. E. G. Waters, Yeo. and R.F.C.
2nd Lieut. D. W. L. Young, R.F.C.

Died of Wounds.

Lieut. N. W. Stewart, R. Scots and R.F.C.

Previously reported Missing, now reported Died of Wounds as a Prisoner of War in German hands.

2nd Lieut. A. E. Wynn, R.F.C.

Previously reported Wounded and a Prisoner of War, now reported Died of Wounds as a Prisoner of War in German hands.

2nd Lieut. A. F. A. Patterson, R.F.C.

Died.

43830 2nd Air-Mech. J. A. W. Brown, R.F.C.
22807 2nd Air-Mech. A. W. Newman, R.F.C.

Wounded.

2nd Lieut. A. F. Barker, Hamps., attd. R.F.C.
Capt. E. A. Beaulah, Lincolns and R.F.C.
2nd Lieut. A. V. Blenkiron, Somerset L.I., attd. R.F.C.
2nd Lieut. H. Butler, R.F.C.
2nd Lieut. A. W. Clarke, R.F.C.
Lieut. B. S. Cole, R.F.C.
2nd Lieut. A. Denison, R.F.C.
2nd Lieut. L. G. Fauvel, R.F.C.
Lieut. H. M. Golding, Gloucesters, attd. R.F.C.
Lieut. W. E. Gower, Sherw. For., attd. R.F.C.
2nd Lieut. E. G. Herbert, R.F.C.
2nd Lieut. P. C. Hollingsworth, R.F.C.
2nd Lieut. J. Houghton, R. Warwicks and R.F.C.
Capt. J. McArthur, R.F.C.
2nd Lieut. A. Matthews, R.F.C.
2nd Lieut. T. F. Northcote, Cav. S.R., attd. R.F.C.
Capt. R. H. Rusby, Gloucesters and R.F.C.
2nd Lieut. A. H. Whistler, Dorset, attd. R.F.C.
36383 2nd Air-Mech. L. Ajderian, R.F.C.

Missing.

2nd Lieut. S. Alder, R.F.C.
Lieut. C. B. Bird, M.C., R.F.A., attd. R.F.C.
Lieut. C. M. Buck, I.A. Res. of Officers, attd. R.F.C.
2nd Lieut. S. F. Cody, R.F.C.
Capt. O. Greig, R.F.C.
2nd Lieut. P. C. E. Johnson, R.F.C.
2nd Lieut. J. V. Lyle, R.F.C.
Lieut. J. E. MacLennan, Cameronians (Sco. Rif.), attd. R.F.C.
2nd Lieut. H. Matthews, R.F.C.
2nd Lieut. T. F. Preston, Yeo. and R.F.C.
2nd Lieut. F. G. Russell, R.F.A., attd. R.F.C.
Lieut. R. W. White, Can. Gen. List, attd. R.F.C.

Previously reported Missing, now reported Prisoners of War in German hands.

2nd Lieut. R. Corbett, Yeo. and R.F.C.
Lieut. J. A. Hollis, E. Yorks., attd. R.F.C.
2nd Lieut. J. C. Lees, R. Scots Fus. and R.F.C.
Lieut. C. H. Windrum, R. West Kent., attd. R.F.C.

THE LATE MAJOR F. W. GOODDEN.

ON February 1st the mortal remains of the late Major Frank Goodden, R.F.C., were laid to rest in the military cemetery at Aldershot, amid every token of sorrow and respect. Full military honours were accorded, and the high esteem in which he was held was plainly evidenced by the enormous attendance. Military funerals have no novelty for the inhabitants of Aldershot and the surrounding district, but Major Goodden had been known for so long to everyone as a most gallant and fearless aviator, and had become personally so popular, that there was a widespread desire, which even the inclement weather could not check, to pay the last homage to his memory.

The tragic circumstances in which he had met his death—making a test flight on a new machine before officially handing it over to the flying officer who had been sent to take it overseas, and who, by a strange whim of fate, chanced to be one of Frank Goodden's oldest friends and colleagues; his magnificent but unavailing fight for life in mid-air, never to be forgotten by those who had the misfortune to witness it; and, lastly, the amazing and scandalous attack on his good name which had been published in a certain quarter on the very day of his burial, all combined to make it one of the most largely attended and most striking funerals in the history of aviation.

The military church was filled with mourners, a notable feature being the attendance of many scores of officers of high rank from the War Office, Adastral House, the Royal Aircraft Factory, representatives from numerous aerodromes, public bodies and leading firms in the aircraft industry. The funeral procession, which was more than half a mile in length, was headed by the band of the Hampshire Aircraft Park. The coffin, draped in a Union Jack and covered with many beautiful wreaths, was borne on a gun-carriage and attended by, amongst others:—

Major-General Ellison, with officers from the Aldershot Command; Col. Carnegie, M.P.; Lieut.-Col. O'Gorman, representing the Aeronautical Society (of which Major Frank Goodden was an Associate Fellow); Mr. Henry Fowler, Superintendent of the Royal Aircraft Factory; Lieut.-Col. Heckstall-Smith; Major Walker-Leigh; Major Turner, and all Officers of the Hampshire Aircraft Park; Lieut.-Col. Huggins, D.S.O., Officer Commanding and twelve Officers from the Southern Aircraft Depôt; Lieut.-Col. Beor; Capts. Egerton, Ellerton, R. W. Thomas, Mansell, Green, W. H. Ewen; Lieuts. Mond, Skeats, Booth, &c. General Sir A. Hunter was also officially represented.

The four pall-bearers were Lieut.-Col. Heckstall-Smith, Major Turner, Major Douglas and Major Walker-Leigh, and the firing party was drawn from the R.F.C. Every parade-ground within sight of the road which winds among the Hampshire hills and commons from the church to Thornhill Cemetery had its regiments drawn up, standing reverently and motionless in the drifting snow, as the procession moved slowly onwards to the haunting melodies of Chopin's "Marche Funèbre."

Passing reference has already been made to an attack on Major Goodden which had been published that day in a contemporary journal. It caused a most painful sensation, and was widely and bitterly discussed, both before and after the sad ceremony. To vilify an officer after his death, when he cannot defend himself, is an unheard of crime. To add wilfully and deliberately to the distress of his parents and other relatives on such an occasion was a brutal and unforgivable thing. Small wonder, therefore, that it aroused a perfect storm of furious indignation among all who knew Frank Goodden—and, indeed, among many who had never met him, but who were sickened and disgusted that any human being, on whatsoever pretext, should accuse him of insincerity, indifference to the safety of his brother officers in the Royal Flying Corps, and lack of patriotism.

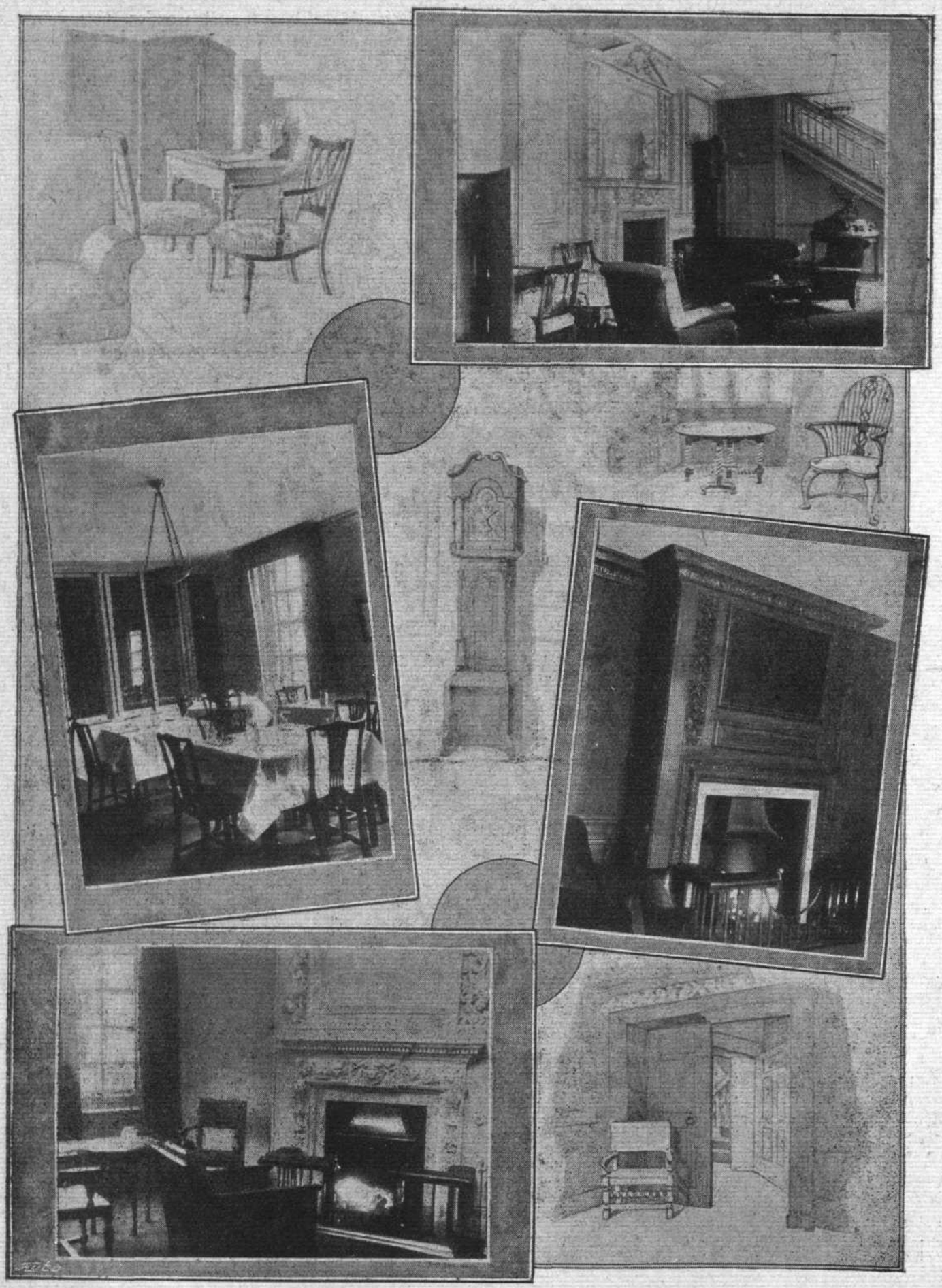
Frank Goodden joined the staff of the Royal Aircraft Factory as a civilian test pilot on August 7th, 1914—that is to say, immediately after the declaration of war, and in the following February he received a commission as Second Lieutenant in the R.F.C., still remaining attached to the R.A.F. At first he was engaged upon experimental and research flying, and also upon the testing of aeroplanes built by contractors. Gradually, however, the latter portion of the work was taken over by the Aeronautical Inspection Department, and his duties at the R.A.F. became almost entirely experimental. He flew the first stable B.E. 2c, built after the death of Mr. E. T. Busk, and in January, 1916, he was appointed head of the Experimental Flying Department at Farnborough. His wide experience, his practical knowledge, and his absolute fearlessness made him a most valuable pilot, and the development of the work at the R.A.F. was greatly advanced by his energy and enthusiasm.

He was keenly interested in all experiments, and constantly undertook, on his own initiative, work which probably few pilots would care to contemplate. Among many other subjects which specially interested him may be quoted that of the spinning stability of aeroplanes. Upon such a question most people would be content to theorise, but Frank Goodden devoted much time to the practical investigation of the causes of spinning and the best methods of recovery. In this and countless other directions he worked tirelessly, and with ever-increasing keenness down to the day of his death.

He was promoted to Squadron Commander, with the rank of Major, in October, 1916, and only those who have been in personal contact with him know how efficient and popular an officer he was. No others have any right to speak of him. To suggest, as has actually been done, that he was imbued with no higher motive than to please those who were in a position to promote his personal welfare, at the cost of the lives of his friends and brother officers, is an infamous journalistic outrage, fortunately without parallel. It is most painful to have to refer to so distasteful a topic, and it has not hitherto been our practice to concern ourselves with the policy of our contemporary, but Frank Goodden is not here to defend himself, and it is a duty to protest against this cruel and cowardly libel on his memory. What those who know thought of it was unmistakably shown at the funeral ceremony.

He was a brave officer and a gentleman, and he died a brave and honourable death in the service of his country.

In connection with the journalistic article referred to above we have received many letters and communications from personal friends of the late Major Goodden and from many others who had no personal acquaintance with the deceased officer. One and all are couched in language of strong protest and disgust at the unprecedented attack. The feeling aroused by this incident is without doubt very widespread.



IN THE ROYAL AERO CLUB-HOUSE, CLIFFORD STREET.—Some views in the Club of the entrance hall (top right hand); on the left, the dining room; on the right, the smoke room; and, bottom, a cosy corner in the bar smoking room.

The Royal Aero Club of the United Kingdom

OFFICIAL NOTICES TO MEMBERS

New Club House.

The New Club House at 3, Clifford Street, W., is now open to Members.

Luncheon and Dinner are served daily, and Bedrooms are available.

Suspension of Entrance Fees of New Service Members.

Until further notice, Service Members will be elected to the Royal Aero Club without Entrance Fee.

Subscriptions.

Members are reminded that the Subscription of £5 5s. for the year 1917 became due on the 1st January last. Bankers' Order Forms can be obtained on application to the Secretary.

Servants' Christmas Fund.

The Subscription List for this Fund is now open.

THE FLYING SERVICES FUND administered by THE ROYAL AERO CLUB.

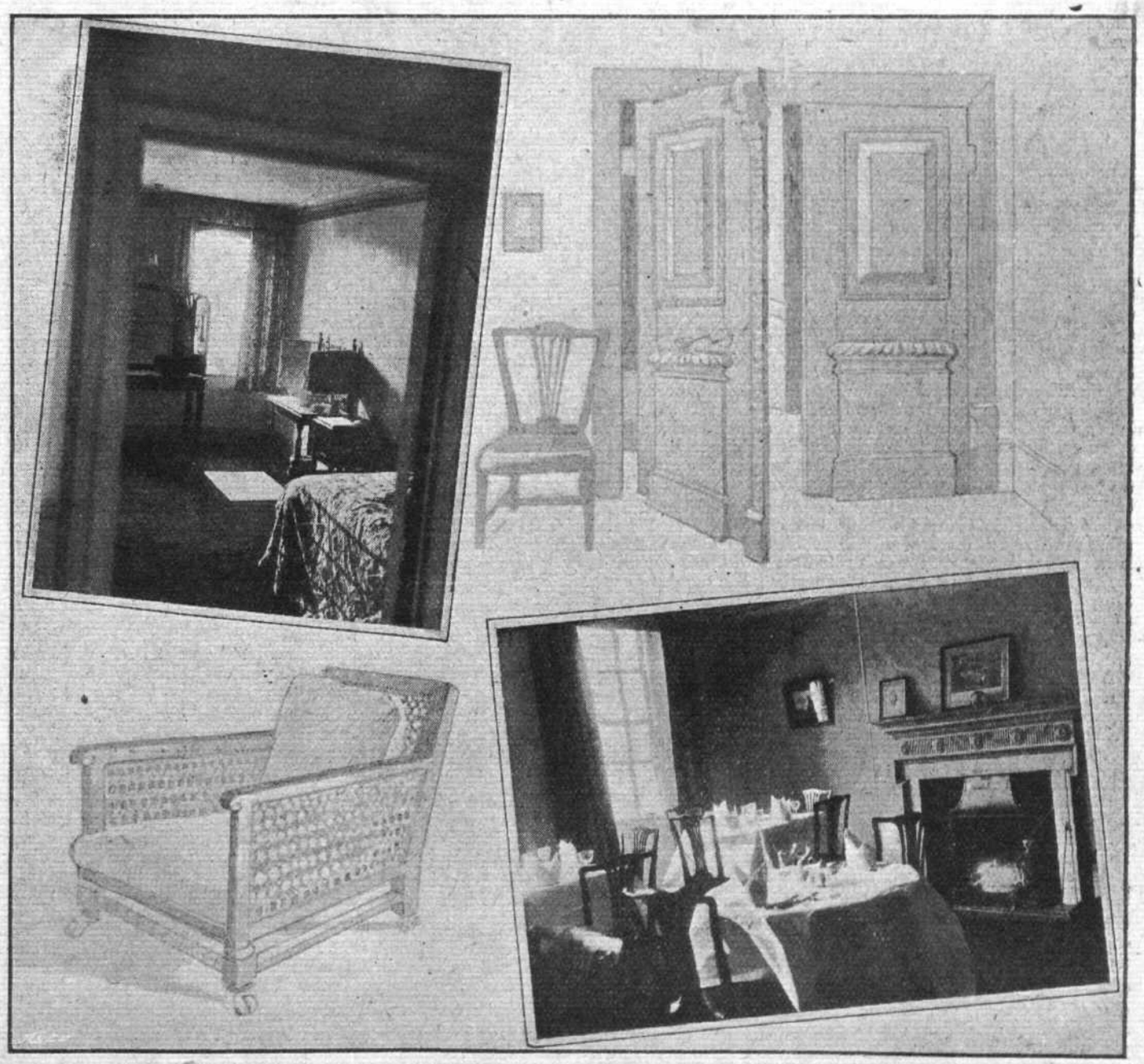
THE Flying Services Fund has been instituted by the Royal Aero Club for the benefit of officers and men of the Royal Naval Air Service and the Royal Flying Corps who are incapacitated on active service, and for the widows and dependants of those who are killed.

The Fund is intended for the benefit of all ranks, but especially for petty officers, non-commissioned officers, and men.

Forms of application for assistance can be obtained from the Royal Aero Club, 3, Clifford Street, New Bond Street, London, W.

Subscriptions.	£	s.	d.
Total subscriptions received to Feb. 6th, 1917	11,130	9	10

B. STEVENSON, Assistant Secretary.
3, Clifford Street. New Bond Street, W.



IN THE ROYAL AERO CLUB-HOUSE, CLIFFORD STREET.—A glimpse of one of the bedrooms; and, below, a corner of the auxiliary dining room.

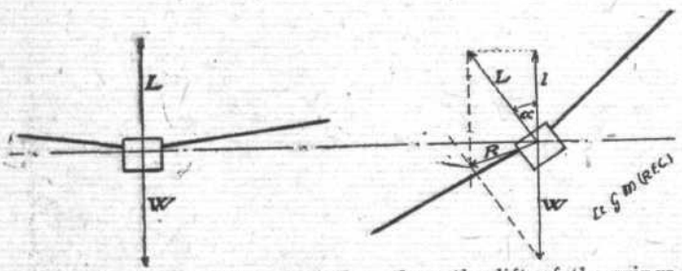
ANSWERS TO CORRESPONDENTS.

[As a number of letters reach us signed with initials only, some of which do not give a complete address, we would point out that such communications cannot be dealt with in our columns. Full name and address, which will not be published, must always be given.—ED.]

Lt. G. M. (R.F.C.).

It is quite a common fallacy to suppose that the fundamental reason why a dihedral angle makes for lateral stability is that the lift of a wing is greatest when the wing is horizontal, and nil when the wing is vertical, and that, therefore, when a machine is tilted over on one side the wing on the lower side lifts more than the wing that is momentarily canted upwards. This is not the case. The reaction on the wings is always at right angles to the chord, and *provided the speed remains constant* a vertical wing will receive as much pressure as a horizontal one. Even when the wing is upside down it will receive the same pressure as before, but the "lift" will act downwards instead of upwards. The accompanying diagrams should help to show why a dihedral will not in itself tend to restore the machine to an even keel until other movements than the roll occur.

A machine flying on an even keel is subject to two vertical forces—one, the weight of the machine, which always acts



vertically downwards; and the ther, the lift of the wings, which acts at right angles to the chord, *i.e.*, vertically upwards when the machine is on an even keel. If the machine is to maintain a horizontal flight path, the lift must, of course, be equal to the weight. Now, suppose the machine to be tilted over on its side by a gust or some other cause. The weight W still acts vertically downwards, but the lift L, being at right angles to the chord, is tilted with the machine, which is, as far as lateral stability is concerned, subject to two forces only, W and L. As the speed is supposed to have remained constant, L is still equal to W, but no longer acting vertically. There are obviously no forces present which tend to restore lateral balance. Other conditions do, however, occur, and it is from these that the righting effect is obtained. In the first place, the vertical component l of L, being one of the sides in a right-angled triangle in which L is the hypothenuse, is obviously smaller than L ($l = L \cos \alpha$), and, as $L = W$, l is smaller than W. The machine must therefore, begin to drop. Further, the horizontal component of L is an unbalanced force, and causes the machine to sideslip. When this occurs righting couples are obviously set up, which tend to bring the machine back to an even keel. We have considered the vertical and horizontal components of L separately for the sake of clearness. Actually, of course, the machine would move in the direction R, which is the resultant of the two forces L and W.

F. W. (Bloxwich).

Apply to the R.N.A.S. recruiting office, Brook Green, Hammersmith, W.

S. H. D. S. (Erdington).

As they are only being tested, there is no need to keep them going for more than a few minutes.

Prop. (London).

For the theory and design of propellers you cannot do better than study Riach's "Air Screws," which can be had for 10s. 11*d.* post free from "FLIGHT" offices, 44, St. Martin's Lane, London, W.C.

"Monoplane" (Harrogate).

"Beaumont" used a Blériot monoplane in the circuit of Britain in July, 1911, while Vedrines, who was second, flew a Morane-Borel monoplane. The Blackburn monoplane, with 60 h.p. Isaacson engine, was piloted by Mr. B. C. Hucks.

A. J. R. (Burnley).

You would find "The Aeroplane Speaks" would be very useful to you, as there is a chapter on rigging, as well as a good deal of information on the care and maintenance of a machine. The book can be had for 6*s.* post free from "FLIGHT" offices, 44, St. Martin's Lane, London, W.C.

R. P. A. (Bristol).

The 70 h.p. Renault engine had eight cylinders, with a bore and stroke fo 3·78 ins. and 5·52 ins. respectively. Normally it ran at a speed of 1,800 r.p.m., and as the propeller was mounted on the camshaft, the propeller speed was 900 r.p.m. The engine was nominally rated at 70 h.p., but the actual brake horse-power was, we believe, 78 h.p. The fuel consumption was 0·64 lb. per b.h.p. hour. The first B.E biplane was, we believe, built in 1911.

L. J. P. (Sleaford).

You can probably obtain a copy of the Technical Terms report from the Aeronautical Society, 11, Adam Street, Adelphi, W.C.

S. O. L. (Stamford).

It is doubtful whether you could get a commission as a pilot in either flying service. Short sight would not necessarily rob you of any likelihood of success as a private pilot. You might be eligible for a commission as an Equipment Officer. Officers in the R.N.A.S. who are not pilots are given R.N.V.R. commissions.

F. P. S. (Bristol).

If you are passed for General Service you will probably not be able to enlist in the R.F.C. unless you are a skilled tradesman. Apply to the R.F.C. recruiting office, The Polytechnic, Regent Street, London, S.W.

R. A. J. (Wellington).

For particulars of the R.F.C. Cadet Corps, apply to Adastral House, London, E.C. It is impossible to forecast what the conditions will be in June next, but if you are fit for General Service you would not be able to enlist in the R.F.C. now, as you are unskilled.

J. A. F. (Rhodes).

See answer to F. P. S. (Bristol). For the R.N.A.S., apply to the recruiting station, Brook Green, Hammersmith, W.

F. S. (Coventry).

If it can be attained without loss of power or efficiency, it would certainly be of value to get an aero engine absolutely noiseless.

F. P. M. (Gosforth).

See answer to F. P. S. (Bristol). There is no charge for replies in this column.

S. W. H. (Manchester).

There would appear to be no reason why you should not obtain a cadetship. With care you could live on your pay.

Jeff.

Your age would probably bar you. After obtaining your Commanding Officer's permission, apply to the Admiralty for the necessary form, and having filled it up send it to the Director of Air Services, Admiralty, S.W.

Scoutmaster (Chertsey).

There are no Flight Sub-Lieuts., R.N.V.R., but officers in the R.N.A.S. who are not pilots are given R.N.V.R. commissions. It is possible to live on the pay, but great care will have to be exercised.

R. S. A. (Shrewsbury).

See latter part of reply to "JEFF."

C. C. C. (Custom House).

The R.F.C. recruiting office is at The Polytechnic, Regent Street, W., where you could obtain particulars as to any vacancies.

A. L. M. (Coulsdon).

You can obtain full particulars of the R.F.C. Cadet Corps from the Directorate of Military Aeronautics, Adastral House, E.C.

FLIGHT

ARMCHAIR REFLECTIONS

By the "Dreamer"

PERHAPS there is something in a man's occupation that stamps him indelibly with the label of his profession; certain it is that with most one has not to study them very long before being able to make a shrewd guess. It is one of my little amusements to study people I meet in trains and other public places, and to try to satisfy myself as to their probable field of activity in drawing in the wherewithal to satisfy the butcher and the baker. In one of O. Henry's inimitable stories of American life I read of a raid on a night-club, where, in order to allay suspicion, the raiders all went disguised as policemen, and there is something more in this than meets the eye at first glance, if you know America.

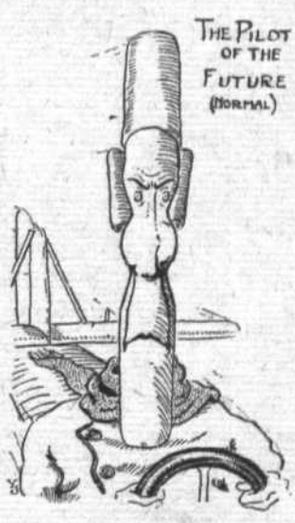
With all honour to the London detective, or man in plain clothes, it has been one of the pleasures of my life that I could tell him a mile away. Not that I have had any great reason to make a special study of policemen, for I have only had to keep my eye open for them for my own special benefit on one occasion, and then I failed in my discovery utterly, but that only goes to prove the rule. No, it was nothing very serious, but as a story told against oneself it may possess a touch of general interest, and as I wish to clear the air of any suspicion of serious crime committed by me, I will give it to you. It was nothing more terrible than an action for trespass, and it was of such a trivial nature, in my opinion, that, on the day of trial, I stayed away from the court, went for a day's outing with a party of friends instead. In the result I got fined forty and costs for my contempt.

Now, this happened in quite a small country town, and it also happened that I knew most of the constables by sight, and more than sight. It also happened that the Chief Constable was my own particular crony in the cosy sanctum of a local hostelry, where summer and winter we used to sample things comforting according unto the custom of recognised society in that particular town at that particular time. Therefore the news of my indebtedness to the legalised highwayman who sat in the court to lay by the heels simple souls and relieve them of their cash, was made known to me in a way not strictly according to established routine. As a fact, it was made known to me every night in the same manner for a good many weeks, not to mention that every constable I met in the daytime would ask me when I was "going to come round and pay the Old Man that money" I was beginning to think that I was going to "wangle" it to my great benefit, when, as I have said, came the great event; I failed to recognise a policeman for once in my life.

I had a splendid little photographic studio in those days, which was carpeted with a lovely "pile" carpet, but which the Clergy, Nobility and Gentry of the district appeared to take no interest in whatever, with the result that many of my days were passed "*cum* camera." But one morning I thought that I had a real live sitter. I was on my knees lighting the fire (the three housemaids, together with the footman and butler having been given the day off) when he walked in, and in my best professional manner I started in to make myself acquainted with his wishes. hoping for at least an order for a dozen 12 by 10 pictures, for my visitor was dressed equal to that expenditure. Well, he didn't want anything of the sort, and because I hadn't the necessary in my pocket at the moment, I had to go with him to the station and remain there whilst a constable went to my house to collect it. However, I had one of those local "comforters" with the chief in the interval.

But as I was saying, whenever any great personage appears in public with the usual bevy of plain-clothes protection, I could go round and pin a ribbon on every one of them.

Somebody has said that the reason one can always tell a stableman is because he cannot do the least little thing without making a hissing noise with his mouth. That is not at all necessary. I could tell a coachman in silent reverie, dressed up in chain mail, provided I could see his face. Doubtless clothes and mannerisms have a lot to do with marking the man as this or as that. In London, with its busy streets and the rapid passing of pedestrians, it is not so easy, but whoever saw an insurance agent in a suburban street without being able to place him immediately? He appears, as a body, to dress in a peculiar way, yet just where he differs from the average person in his own rank in life, I cannot say.



Then he has, in conjunction with the policeman, a queer, interested way of looking at everybody, a kind of looking for business sort of thing. He may have his book in his pocket, but his stick is a recognised trade mark. There is something funny about the sticks carried by insurance agents. A man late of the army can be told by his upright, marching style of walking, and a sailorman by his free rolling swing of arms and legs. Newspaper men have the same way of looking at everybody as the constable and the insurance agent, amplified by

a certain indescribable extension of the ear-listening aspect, also, unconsciously I will grant him, a way of overlooking papers and "matter" being read by his fellow. A man may tell a lawyer without the assistance of the carrying of the brief-bag, and the retired Indian officer has chutney written all over him.

But what I am most concerned with is whether a man's occupation does really alter his facial anatomy, or whether it is that men of a certain cast of features and a certain shaped head enter certain professions. I have never been quite clear in my own mind whether the phrenologist reads bumps that tell him the business one is most suited to, or whether he is reading the bumps produced, as I feel certain some are, by reason of a man having already been engaged in some particular business for a number of years. I have a shrewd idea that, like fortune-telling, one gives much of the information sought to a clever person able to see it and hand it back as original.

Mr. E. Temple Thurston, in his delightful book "The Five Barred Gate," has some very interesting things to say on this very matter. Interesting they were to me, because he includes the flying man of the future in his category. He says that even now the mark of their job is becoming stamped upon their faces. That in their eyes is the look of distance, and about their foreheads and upon their lips an expression of resistance to "the swift rushing of mighty winds." And he goes on to say that in years to come, when men have flown until flying has become the habit of their lives, "Perhaps their type of countenance will be that of a propeller at rest." He adds "They will not be handsome men."

It may be true, that which he thinks of the flying man of the future, but I trust it will take long enough to mature to enable me to finish my little job on this rotating sphere. I don't want my friends to have faces like props, especcially props at rest. I have seen men of to-day, men who have nothing to do with aviation, who have been allotted by nature, or acquired by other measures—many measures it must have been—faces that look like nothing on earth so much as like a prop, but one at fifteen hundred revs., and a four-blader at that.

As these "Reflections" are now passed on to our tame artist for "indenting," I do hope he will treat the pilot of the future with merciful consideration, so as not to unduly prejudice the Services.

HONOURS FOR R.F.C.

A SUPPLEMENT to the *London Gazette*, issued on February 1st, gives the following honours and rewards for valuable services rendered in connection with Military Operations in the Field, with effect from 1st Jan., 1917 :—

DISTINGUISHED SERVICE ORDER.

South African Forces.

Temp. Major G. P. WALLACE, Capt., S. Afr. Def. For. and R.F.C.

MILITARY CROSS.

2nd Lieut. (Temp. Capt.) G. W. HODGKINSON, Yeo. and R.F.C.
2nd Lieut. B. H. E. HOWARD, Manch. R. (S.R.) and R.F.C.
2nd Lieut. (Temp. Lieut.) G. St. V. PAWSON, Yeo. and R.F.C.

South African Forces.

Lieut. LIONEL COHEN, S. African Horse (attd. R.N.A.S.).
Temp. Capt. E. C. EMMETT, Temp. Lieut., S. Afr. Def. For. and R.F.C.

DISTINGUISHED CONDUCT MEDAL.

Z 179 Sergt. A. J. HORNE, R.F.C.
Z 150 Corpl. S. F. MARUCCHI, R.F.C.
Z 8 Corpl. C. J. THOMSON, R.F.C.
Z 31 Flight-Sergt. T. TURNBULL, R.F.C.

Snap on the Front in France, showing an aeroplane which landed on a house through engine trouble.
Official photograph issued by the Press Bureau.

THE graphical representation of the losses in aeroplanes which the Germans claim were sustained by the Allies on the Western front during 1916, appeared in the *Frankfurter Zeitung* of January 23rd, 1917. Although its accuracy may, perhaps, be open to grave doubt, it is interesting in showing the claims made by the enemy. In the graph the figures *above* the columns give the total number of machines claimed to have been shot down during the month, while the figures *below* the columns represent the number of machines claimed to have been actually captured during the month.

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THE following are the comments of the *Frankfurter Zeitung* upon these claims :—

"Through the fighting skill of German pilots 66 enemy aeroplanes were shot down in the month of December, as against 21 German machines brought down by the enemy. This brings, as already stated from a reliable source, the total number of enemy aeroplanes brought down since the beginning of 1916, by our pilots in conjunction with our anti-aircraft defences, up to 784. Our own losses during the same period amount to 221 aeroplanes. The figures for the Western front alone amount to 739 enemy and 181 German aeroplanes. These figures furnish striking evidence as to who is the stronger in the fight. In spite of the numerical superiority of our enemies our aviators have succeeded, by their skill and fighting spirit, in clearing the air above our own troops from enemy aviators. Rarely and only in strong squadrons does the enemy venture over our front, to drop his bombs at random as soon as German aeroplanes approach to chase off the intruder."

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THE total losses in German and enemy aeroplanes during the months of 1916 are set out as follows :—

Enemy losses: January, 20; February, 23; March, 49; April, 36; May, 47; June, 43; July, 85; August, 84; September, 133; October, 104; November, 94; December, 66. Total, 784.

German losses during the respective months: 5, 8, 19, 24, 16, 10, 23, 24, 23, 17, 31, and 21. Total, 221.

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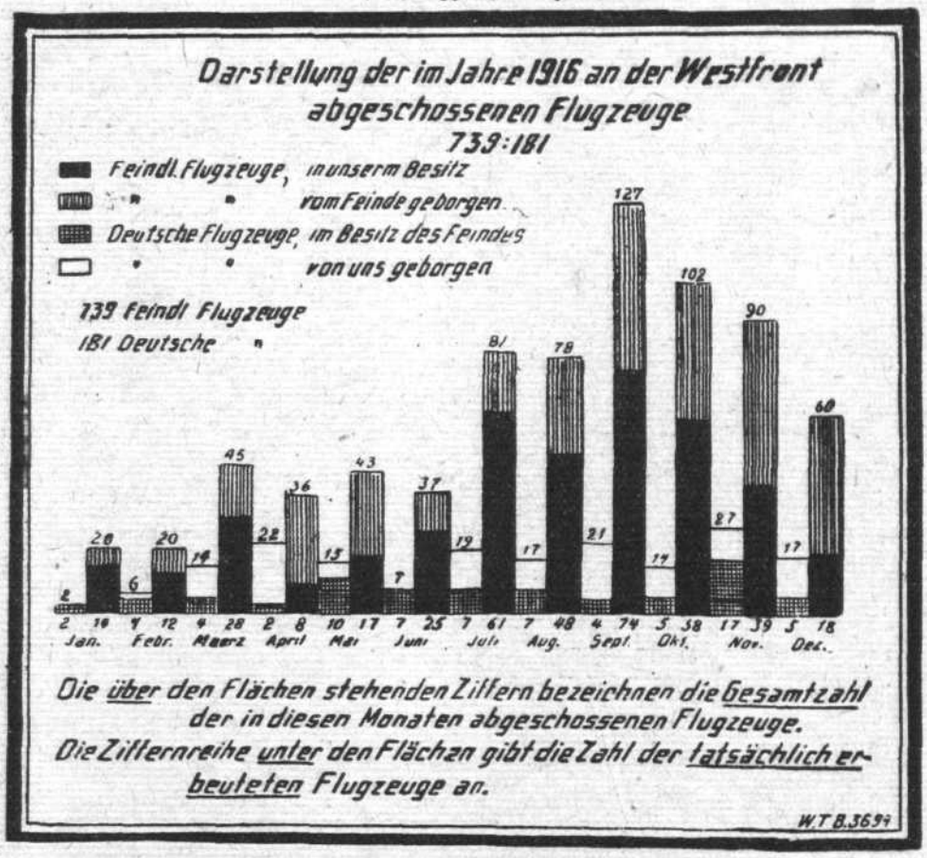
A propos these claims by the Germans, another side of the picture is presented by the French newspapers of February 1st, showing that from information in the possession of the French aviation service, it appears that the Germans lost 417 machines last year. They lost two in January, 17 in February, 22 in March, 27 in April, 41 in May, 18 in June, 49 in July, 49 in August, 70 in September, 41 in October, 39 in November, and 42 in December. These machines are definitely known to have been destroyed and 195 others have been damaged, some of them beyond repair. Further, 20 sausage balloons were brought down.

Der Kampf der deutſchen Flieger.

784 feindliche Flugzeuge abgeſchoſſen.



FREE TRANSLATION.

Air losses on Western Front in 1916.

Enemy 'planes in our possession.

Enemy 'planes destroyed by enemy.

German 'planes in enemy's possession.

German 'planes 'destroyed by us.

The figures *above* the columns give the number of machines *shot down* during the month.

The figures *below* the columns give the number of machines *actually captured* during the month.

A PATHETIC reminder that in the midst of Life we are in Death, was forthcoming at the funeral of Major Frank Goodden, last week. His grave at Aldershot, was next to that of Lieutenant Evans, R.F.C., who had but a few days previously met with a similar fate to poor Goodden, and on the grave was lying a wreath, still fresh, inscribed "In loving Memory From Major Goodden."

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SOME remarkably stirring pictures were to be seen last Monday at the Polytechnic, Regent Street, when the official films taken by the Italian Naval Authorities were shown in the presence of the Italian Ambassador and the Italian Naval and Military Attachés. The scene of the pictures is in the Adriatic, and prominence is given to some very realistic work of warships actually in action, including a torpedo-boat attack on a hostile Austrian submarine. It is all highly exciting, and this film is followed by another depicting an

attack on Venice by an Austrian aeroplane squadron and the subsequent fight in the air. The anti-aircraft guns are seen in action, and views of the Italian aerodrome show the departure of a defensive fighting squadron. The battle in the air makes a thrilling series of photographs. The Ancre battle pictures and the "Tank" films are also being shown.

ON Saturday the R.F.C., at Oxford, came off best, by 8 goals to 4, against the Isis Hockey Club.

THOSE who have recollections of the gracious simplicity of Prince Henry of Prussia, when he was wont to favour this country by visits, which may well now be regarded in the light of magnificent spying, may be gratified to learn that he also is suffering from German frightfulness, as he has now, after mature consideration, become a *Schirmherrschaft* of an Aeronautical Exhibition in the land of the Huns. According to a correspondent this means, literally, "umbrella domination," and has been substituted officially in Germany for the word *Protektoral* (patronage). It certainly serves the Kaiser's brother right. We shall look forward with awe to what the Kaiser himself will presently be designated for *his* barbarities.

ANOTHER opportunity serves for helping the R.F.C. Hospital. An exhibition has, under the auspices of the Secretary of the W.O., been gotten together of Zeppelin wreckage and aerial photographs, in the grounds of the Middle Temple, on the Embankment, opposite Temple Pier. On Tuesday, the Lord Mayor attended an informal opening ceremony, and since then the public can see what he saw by paying 6d. at the entrance gate. The proceeds go to Military Charities, and any private subscriptions received by the Lord Mayor will be ear-marked for the Royal Flying Corps Hospital.

CAPTAIN AMUNDSEN, the Norwegian explorer of South Pole fame, on Tuesday passed through London on his way from the United States, *viâ* Liverpool, to Norway, where he is to complete his plans for making acquaintance with the North Pole. As before announced, Captain Amundsen has great faith that he will be able to accomplish much more successfully by aeroplane, what previous explorers have so strenuously striven for across the ice packs. He hopes to launch his ship at Christiania next March, and to start upon his scientific expedition in the summer of 1918.

THOSE "informations" so freely and artfully concocted in Switzerland for other than German consumption, regarding the loss of confidence of the Great General Staff in Zeppelins, must be taken with a grain of salt. Without doubt, the Huns would like us to go to sleep with the satisfaction of having layed these horrid visitations, but you never know. We fancy our defences will hardly be slackened, just in case the G.G.S. suddenly changes its mind and takes a sporting chance with another dozen Zepps., more or less, for straffing purposes against the much loved Briton.

WHAT Berlin would have us believe (*vid* Zurich) this time is that great consternation has been caused in German Parliamentary circles by the news which recently leaked out that the aerial experts of the Great General Staff have advised the Minister of War not to construct any more Zeppelin airships for the army. At the same time, it has become known that the advisers on aerial matters to the Naval Staff also advised, some time ago, that Zeppelin airships should be used only for scouting, and not at all, or only secondarily, for attacks on enemy countries or enemy fleets. Both groups of experts based their recommendations on the argument that practical experience has revealed great defects in the Zeppelin airship. It is condemned as being too unwieldy, too susceptible to weather, and altogether too vulnerable. Still, let us keep the air-defence fires burning just the same.

AT the same time let us not neglect provision for the reprisal acts, which *must* sooner or later come into active operation to check these super-barbarians. That something of the sort is likely to materialise is already making some of the possible recipients creepy. Reichstag members are already getting uncommonly uneasy about Germany's art treasures and cathedrals. And well they may, after all the iniquities which their own fellow citizens have perpetrated in the sacred name of "Kultur." Wait and see.

WONDER if that extra special strafing powder of Sir Theodore Cook's will be available by the time our little essays get into full swing?

"'ENGLAND' be d——, make it Britain" is the unusually short greeting which has reached us this week from our very close reader, who watches with unwearying perseverance away up in Edinburgh for these little slips. Our inadvertent lapse this time was that Scotland was not embraced in the ideals for the welfare of mankind which we accused England for the past hundred years of standing for, and which, apparently, Wilson (of the U.S.) has only recently discovered. We thank our Edinburgh critic for his consideration in sending us upon this occasion so short and crisp a reprimand, which it is possible to publish.

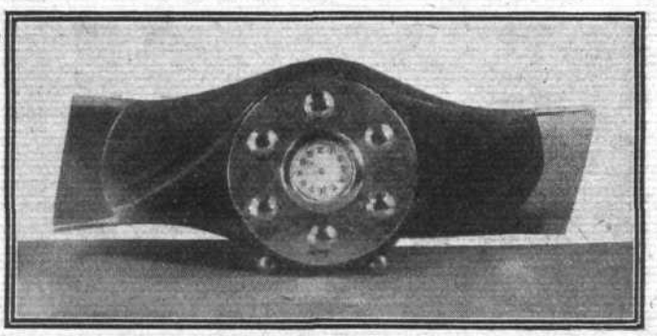
A GOOD many enthusiasts will learn with considerable regret that, for the present at least, their enjoyment of the privileges, &c., hitherto obtainable at Hendon Aerodrome is a thing of the past. The W.O. having taken over the whole p ace, including a number of sheds of the Grahame-White Aviation Co., Ltd., the owners of the Aerodrome, the Company can no longer grant admission to the public either as onlookers or seekers after passenger flights. National Services come first, and, therefore, until further notice the much appreciated Hendon Aerodrome must be regarded as "Verboten."

What a re-opening there should be, however, when the time comes round again for the gathering of the Air Clans down Hendon Way!

THE father of Lieutenant Wulstan J. Tempest, of the R.F.C., has a souvenir of his son's exploit against a Zeppelin which he destroyed and for which he gained the D.S.O. In making his descent after destroying the airship, Lieutenant Tempest's machine was damaged, and he presented the "boss" of the propeller to his father. Mr. Tempest, senr., had the relic polished, and while preserving its shape had it converted into a handsome timepiece, which has been viewed by the magistrates of the Pontefract West Riding Bench, of which Mr. Tempest is chairman.

WHICH reminds us that long, long ago the same idea was carried out by one of FLIGHT's subscribers, and this is what we wrote at the time, our reproduction of the little ornament in question giving an idea of the unique character of this novel ornament.

"BROKEN propellers are fairly common in these days of school activity. Any of our readers who may be adding matrimonial bliss to their other troubles, and wishing to prove themselves handy men, may be interested in a little home-made clock stand sent in by a subscriber. It is fashioned from an old broken Caudron propeller, the jagged ends being sawn off and bound in sheet brass. The boss is covered



by a brass plate bored to take the bolts, the heads of which are nickel plated. The central hole is enlarged so that the clock slips easily into position. With the brass parts lacquered and the wood polished it makes quite a neat little ornament. As in most cases the 'prop.' would have, in addition, a sentimental value for one or other reason, more interest would, of course, attach to this effective form of clock stand."

MR. PEMBERTON BILLING'S decision to resign his seat for East Herts and to seek re-election, is perhaps the most straightforward solution to the whole position which has arisen since his return to Westminster. It is for his constituents to say whether they endorse his methods of procedure or the reverse, and under the circumstances Mr. Billing is well advised to ask for confirmation of their original mandate or accept a verdict to the contrary, should they so decide.

SAFETY-FACTOR *versus* Performance.

Is it either wise or worth while, in the long run, to cut down the factor of safety to vanishing point, for the sake of an extra margin of performance?

COMMANDER SAMSON please, not Sampson, Mister "Looker-on."

TEN YEARS AGO.

Excerpts from the "Auto." ("FLIGHT'S" precursor and sister Journal) of February, 1907. "FLIGHT" was founded in 1908.

DUMOULIN STABILISATEUR.

The old notion of automatically controlling the movements of an aeroplane by means of a gyrostat, which has recently been frequently discussed, and was very much discussed long ago, when Sir Hiram Maxim was making his celebrated experiments, if not actually proposed by him, is said to be the principle on which M. Dumoulin constructs his aeroplane. Other intelligible details of the machine itself are not yet to hand, but it is understood to be of the single-deck type.

The Air Board.

IT was officially announced on February 6th that the following will form the personnel of the Air Board :—

President—Viscount Cowdray.
Parliamentary Secretary—Major J. L. Baird, M.P., C.M.G., D.S.O.
Fifth Sea Lord of the Admiralty—Commodore G. Paine, C.B.
Director-General of Military Aeronautics—Lieutenant-General Sir David Henderson, K.C.B.
Controller of Aeronautical Supplies—William Weir.
Controller of Petrol Engines—Percy Martin.
Secretary—Sir Paul Harvey, K.C.M.G., C.B.
Assistant Secretary—H. W. W. McAnally.
Private Secretary to the Parliamentary Secretary—C. G. Evans.

In the *London Gazette* of February 6th it was stated that the King had ordered the constitution of the new Air Board to be as follows :—

(1) The Air Board shall, until it is by Order in Council otherwise directed, consist, in addition to the President, of the following :—

(*a*) A Parliamentary Secretary of the Board ;

(*b*) The Lord Commissioner of the Admiralty who is charged with the direction of the Naval Air Services ;

(*c*) The member of the Army Council who is charged with the direction of Military Aeronautics ;

(*d*) The Controller of Aeronautical Supplies and the Controller of the Petrol Engine Department, of the Ministry of Munitions ;

(*e*) Additional members as may from time to time be found desirable.

THE DE LA VAULX AIRSHIP.

The De La Vaulx airship went out again on the 4th of the present month, making its eighth excursion, at 2.45, when it manœuvred in the direction of St. Germain, turned at the Pecq Bridge, and, after passing over Vesinet, returned at 9 minutes past 3, having been travelling through the air some 22 minutes; in which time it covered a distance of between 12 and 13 kiloms. The airship continued to practise manœuvres for some 13 minutes more, and came down to anchor at 22 minutes past 3; 73 kilogs. of ballast were carried, 50 cubic metres of hydrogen having been added to the gas-vessel, which has now been inflated for 47 consecutive days. The average height at which the manœuvres were carried out was some 200 metres, and the maximum height reached was 300 metres.

(2) In the event of one or other of the officers named under the letters (*b*), (*c*), (*d*) above being unable to attend a meeting of the Board, the Department to which he belongs may designate an officer to attend in his place.

(3) Members of the Air Board other than those who are appointed in virtue of the holding of certain offices shall be appointed by the President of the Board.

(4) Members of the Air Board appointed in virtue of the holding of certain offices shall continue to be members of the Board so long as they hold those offices. Members appointed otherwise than as aforesaid shall hold their appointments at the pleasure of the President of the Board.

(5) This Order may be cited as the Air Board Order, 1917.

The New Board of Admiralty.

IT was announced in the *London Gazette* of February 6th that the King has been pleased, by Letters Patent under the Great Seal, bearing date January 11th, 1917, to appoint :—

The Right Honourable Sir Edward Henry Carson, K.C. ;
Admiral Sir John Rushworth Jellicoe, G.C.B., O.M., G.C.V.O. ;
Admiral Sir Cecil Burney, G.C.M.G., K.C.B. ;
Rear-Admiral Frederick Charles Tudor Tudor, C.B. ;
Captain (Commodore, 1st Class) Lionel Halsey, C.B., C.M.G. ;
Captain (Commodore, 1st Class) Godfrey Marshall Paine, C.B., M.V.O. ;
Captain Ernest George Pretyman; and
The Right Honourable Sir Francis John Stephens Hopwood, G.C.B., G.C.M.G.,

to be Commissioners for executing the Office of Lord High Admiral of the United Kingdom of Great Britain and Ireland, &c.

Copyright, F. N. Birkett, from the F.N.B. Series of Aviators.

Some pilots who have secured their flying certificates at the Hall School of Flying, Hendon Aerodrome. 1. Mr. J. E. Pugh ; 2. Mr. J. H. W. Maude ; 3. Lieut. Raymond B. D. Malden ; 4. Pte. A. C. Packman ; 5. Mr. E. E. Hill ; 6. Mr. J. C. Bateman ; 7. Mr. J. L. Mayer.

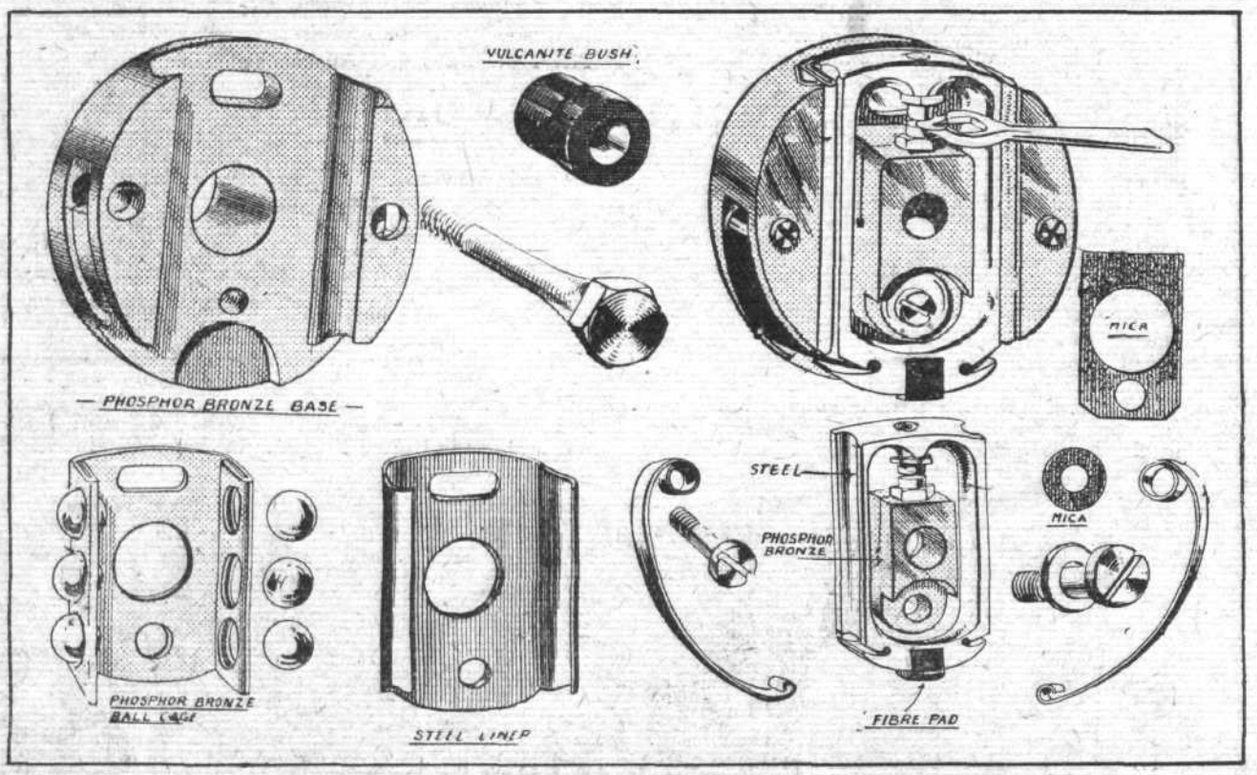
AN INTERESTING CONTACT BREAKER FOR MAGNETOS.

OF all the many causes to which engine failure can be traced, ignition troubles are by no means the least frequent. Sometimes the trouble is found in sooted-up sparking plugs or in leaky connections, but in a good many cases the cause is to be found in the magneto itself. This is, perhaps, more frequently the case with the magnetos of seaplane engines, owing to the always present possibility of sea-water getting into the magneto. One source of trouble often met with in magnetos in which the pivot for the bell-crank lever is supported in a fibre bush, is that, when water gets into the contact breaker, the bush expands and may do so to such an extent that the bell-crank lever becomes inoperative, owing to seizure. It was with a view to obviate this trouble, among others, that the contact breaker illustrated in the accompanying sketches was thought out. In its present form the new contact breaker—which was designed by Mr. G. F. Cooke, of 2, Fairfax Road, Bedford Park, W.—is the result of many experiments, and in several trial runs with one of these contact breakers some excellent results were obtained, and Mr. Cooke—who, in a long association with the Bosch firm has had a great deal of experience in magneto work—is confident that his invention in its present form will be found thoroughly reliable for all classes of work.

The Cooke contact breaker has, as will be seen from an inspection of the accompanying illustrations, a phosphor bronze base machined to the shape shown. Into the forward projections of this base is driven a steel liner, forming one of the bearing surfaces for the ball-bearings of the moving portion of the contact breaker. The second bearing surface is formed by the contact breaker itself, which is of steel and shaped as shown. A ball cage of phosphor bronze or brass, bent as shown in the sketch, retains the six balls, three on each side, which are accommodated in slots in order to allow for the travel of the moving contact. In bending the ball cage the metal is not pressed into close contact, a small space, which can be seen in the sketch, being left between the two surfaces. This space serves as a reservoir for lubricant, which is held therein by capillary attraction.

At the bottom the moving contact is given a curved surface, at the lowest point of which is inserted a small pad of fibre in order to reduce wear and noise. Fitting into recesses near the lower end of the moving contact are two flat steel springs, resting in grooves in the base and secured at their other end by screws. These springs ensure the positive return of the moving contact.

The fixed contact is formed by a piece of phosphor bronze of the shape shown in the sketch, and insulated from the base by the mica packing. It has three holes—one conical to receive the large screw that secures the whole contact breaker, one for the smaller fixing screw at the bottom end, and a third hole tapped to receive the platinum-tipped contact point. A transverse slot in the fixed contact enables the contact point to be locked in position by simply tightening up the centre screw. In order to adjust the distance between the contact points, a small spanner, shown in the illustration, is employed. A small inspection window is provided in the base, through which the distance between the contact points can be ascertained. For purposes of inspection all that is necessary in order to remove the contact breaker is to unscrew the large central screw, when the whole base comes away bodily, and the contact points can be inspected and adjusted. If further examination is desired the whole contact breaker is dismantled by unscrewing the small screw in the fixed contact and the two screws securing the leaf springs. The fixed contact can then be removed and the moving contact slipped out of its bearings. Being guided by the ball race the moving contact, on being inserted, is always in line with the fixed contact, and the only adjustment ever necessary is that of the distance between the contact points.



Details of the Cooke contact breaker for magnetos.

From the mechanical point of view the Cooke contact breaker appears to be a thoroughly sound piece of work, positive in its action, and with no parts likely to get out of order even under the most trying conditions. It is, we understand, easily fitted to any Bosch type of magneto, and should recommend itself for a thorough trial.

French Honour for Greek Officer.

GENERAL SARRAIL has awarded the Croix de Guerre with Palms to Major Verikios, an officer of the Greek Army of National Defence, for distinguished service in the air.

A French Farmer's Capture.

DETAILS have reached Paris of how two German aviators were captured by a farmer the other day in Normandy in a field in the Eure Department. It appears that the farmer, whose eldest son had been killed in the war, was in his field with a gun, and the two German officers, one of whom had the inevitable Iron Cross, put up their arms and surrendered. They said they were dying of hunger, and on being given a 4-lb. loaf of bread ate it heartily. They explained afterwards that they had flown over Amiens, anti-aircraft guns scored a hit on their motor, and then they lost their way, and after wandering about for some time their engine stopped, and they had to come down. They did not appear very sorry to be taken prisoners.

FLIGHT

The British Air Service

"PER ARDUA AD ASTRA"

UNDER this heading are published each week the official announcements of appointments and promotions affecting the Royal Naval Air Service and the Royal Flying Corps (Military Wing) and Central Flying School. These notices are not duplicated. By way of instance, when an appointment to the Royal Naval Air Service is announced by the Admiralty it is published forthwith, but subsequently, when it appears in the LONDON GAZETTE, *it is not repeated in this column.*

Royal Naval Air Service.

Admiralty, January 30th.

Temp. Lieut. E. Childers promoted to the rank of Temp. Lieut.-Com., with seniority Dec. 31st.

Admiralty, February 1st.

The under-mentioned Temp. Sub-Lieuts., R.N.V.R., promoted to the rank of Temp. Lieut., R.N.V.R., with seniority as stated: C. F. Yeomans, W. W. Farthing and E. S. Sturdee, Jan. 30th; W. C. C. Sykes, Jan. 22nd.

Petty Officer (R.N.V.R.) C. S. Goddard and A.B. (R.N.V.R.) W. T. Morris granted temp. commissions as Sub-Lieut., R.N.V.R., with seniority Jan. 30th.

Chief Petty Officers H. J. Grant (pensd.) and H. Stafford granted the rank of Temp. Acting Gunr., R.N., to date Jan. 29th.

Admiralty, February 2nd.

The following granted temp. commissions as Lieuts., R.N.V.R., and appointed to "President," additional, for R.N.A.S., all to date Feb. 1st: S. Henderson, N. D. Newall, R. G. B. Bird, A. A. Sutton and H. A. Dawson.

Messrs. W. R. Horsfield and E. D. Densham granted temp. commissions as Sub-Lieuts., R.N.V.R., and appointed to "President," additional, for R.N.A.S., to date Feb. 1st.

Flight Sub-Lieut. J. A. Barron promoted to Flight-Lieut., with seniority Oct. 1st.

Temp. Sub-Lieuts. (R.N.V.R.) G. C. A. G. Nicholson and C. P. Sheppard entered as Prob. Flight Officers for temp. service, and appointed to "President," additional, for R.N.A.S., both to date Jan. 30th.

Admiralty, February 5th.

Lieut. (Can. Gen. List) H. H. Reade entered as Prob. Flight Officer, for temp. service, to date Feb. 3rd.

Temp. Prob. Flight Officer C. H. Keith promoted to Temp. Flight Sub-Lieut., with seniority Oct. 10th.

London Gazette Supplement, February 5th.

The undermentioned to be Temp. Lieut.-Cols. whilst employed as Wing Coms., R.N.A.S.:—Dec. 31st: Capt. (Temp. Major) J. N. Fletcher, R.E.; Capt. (Temp. Major) J. D. Mackworth, R.W. Surr. R.

Royal Flying Corps (Military Wing).

London Gazette, January 30th.

Wing Commander.—Capt. (Temp. Major) J. E. Tennant, M.C., Scots Gds., from a Sqdn. Com., and to be Temp. Lieut.-Col. whilst so employed; Jan. 11th.

Flying Commander.—2nd Lieut. (Temp. Lieut.) A. S. Redfern, R.W. Surr. R. (T.F.), from a Flying Officer, and to be Temp. Capt. whilst so employed; Jan. 1st.

Flying Officers.—2nd Lieut. E. H. Bryant, Essex R. (T.F.); Jan. 5th. 2nd Lieut. D. Welch, S.R.; Jan. 6th. 2nd Lieut. E. L. Bishop, Worc. R., S.R., from attd. Worc. R. (T.F.), and to be secd.; Jan. 7th. Jan. 8th: Lieut. B. Harvey, 224th Canadian (Forestry) Bn.; Temp. 2nd Lieut. L. D. Brown, Gen. List, from a Flying Officer (Obs.), with seniority from May 31st; 2nd Lieut. (on prob.) A. H. Tanfield, A. War. R., S.R. Temp. 2nd Lieut. A. A. Gray, M.C., Durh. L.I., and to be transfd. to Gen. List; Jan. 10th. Temp. 2nd Lieut. (on prob.) F. J. Taylor, Gen. List; Jan. 11th. Temp. 2nd Lieut. R. S. Asher, Gen. List; Jan. 12th. 2nd Lieut. (on prob.) H. A. Moncrieff, Dorset R., S.R., and to be secd.; Jan. 14th. Jan. 15th: Temp. 2nd Lieut. L. H. Leckie, Gen. List; Temp. 2nd Lieut. R. C. Savery, Gen. List; 2nd Lieut. D. F. Stiven, S.R.; Temp. 2nd Lieut. J. C. Griffith, Gen. List.

Balloon Company Commander.—Temp. 2nd Lieut. W. S. Huxley, Gen. List, from a Balloon Officer, and to be Temp. Capt. whilst so employed; Jan. 13th.

Equipment Officers, 1st Class, and to be Temporary Captains whilst so employed.—Jan. 1st: Lieut. H. K. Maxwell, S.R., from the 2nd Cl.; Lieut. E. A. E. Wood, S.R., from the 3rd Cl. 2nd Lieut. (Temp. Lieut.) H. R. Vagg, Som. L.I., from the 2nd Cl.; Jan. 14th.

2nd Class.—Temp. 2nd Lieut. T. G. Gordon, Gen. List, from the 3rd Cl., and to be Temp. Lieut. whilst so employed; Jan. 29th.

Memoranda.—The under-mentioned to be Temp. 2nd Lieuts. (on prob.) for duty with R.F.C.: D. B. Walker; Jan. 12th. H. W. Arnott; Jan. 15th.

Supplementary to Regular Corps.—The under-mentioned 2nd Lieuts. (on prob.) are confirmed in their rank: A. P. F. Rhys-Davids, A. C. Young, D. F. Stiven, H. W. Prockter, D. Welch, A. R. Mitchell, S. G. Linssen, S. A. Mitchell, W. G. Murray, C. Groves, F. G. Buck, C. J. S. Holden, A. T. Griffith, S. J. Vine, S. Wilson, A. G. Stradling, J. A. Cowling, R. Rochford, J. D. Richards, L. S. Pape, W. S. Farley, F. P. Proud, F. D. Lugard. H. H. Chivers to be 2nd Lieut.; Jan. 1st. The under-mentioned to be 2nd Lieuts. (on prob.): Oct. 16th: E. H. Garland, G. G. A. Martin, M. C. McGregor, J. M. Warnock. G. A. Learn; Jan. 10th. Jan. 12th: E. McRae Cockell, F. Dugdale, F. T. Hill, R. A. G. Shepherd, C. Q. Steel, R. D. Whitt. D. R. Pye; Jan. 27th.

London Gazette Supplement, February 1st.

The under-mentioned to be Temporary 2nd Lieuts.:—

For Duty with R.F.C.—Jan. 2nd: Sergt. W. J. Pearson, from D. of Lanc. Yeo. (T.F.); Sergt. L. R. Brereton, from Can. Engrs.; L.-Corpl. T. Humble, from Northd. Fus.; L.-Corpl. J. E. Middleton, from A.S.C. Jan. 4th: Pte. N. H. de Vaudrey Heathcote, from Lond. R. (T.F.); Pte. H. H. Down, from Lond. R. (T.F.). Jan. 7th: Sergt. S. Cooper, from Lond. R. (T.F.); Sergt. H. Fall, from Can. A.S.C.; Sergt. F. M. McLaren, from Can. A.S.C.

Flying Officers.—2nd Lieut. J. S. Smith, N. Staff. R., S.R., and to be secd.; July 17th. Jan. 6th: Temp. 2nd Lieut. G. E. Ransom, attd. R. Fus.; Temp. 2nd Lieut. E. T. Carpenter, Gen. List. Jan. 8th: Temp. 2nd Lieut. A. Ralphs, L'pool. R., and to be transfd. to Gen. List; Temp. 2nd Lieut. J. Southall, Gen. List. Jan. 9th: Temp. Lieut. F. J. Martin, A. Cyclist Corps, and to be transfd. to Gen. List; 2nd Lieut. (Temp. Lieut.) R. T. B. Schreiber, Suff. R. (T.F.); Temp. 2nd Lieut. O. Matson, Gen. List. Jan. 10th: Temp. Lieut. E. P. M. Robinson, Gen. List, from a Flying Officer (Obs.), with seniority from May 31st; Temp. 2nd Lieut. A. S. Lee, attd. Notts. and Derby. R.; 2nd Lieut. E. J. D. Townesend, R.A., and to be secd.; 2nd Lieut. A. P. F. Rhys-Davids, S.R. Jan. 11th: Temp. 2nd Lieut. J. R. S. Proud, R.W. Kent R., and to be transfd. to Gen. List; 2nd Lieut. C. H. James, 5th Australian Inf., Australian Imperial Force. Jan. 12th: 2nd Lieut. W. B. Hills, Hamps. R. (T.F.); 2nd Lieut. (on prob.) K. J. Knaggs, R. War. R., S.R., and to be secd. Jan. 13th: 2nd Lieut. H. W. L. Poole, D. of Corn. L.I., S.R., and to be secd.; 2nd Lieut. J. E. Taylor, Welsh Divl. Signal Co., R.E. (T.F.); 2nd Lieut. W. E. Holland, Sco. Horse Yeo. (T.F.).

Equipment Officers, 2nd Class.—From the 3rd Class, and to be Temp. Lieuts. whilst so employed: 2nd Lieut. G. L. Main, S.R.; Nov. 15th. Nov. 26th: Lieut. J. S. D. Harries-Jones, S.R.; 2nd Lieut. G. G. Fiddes, S.R. Dec. 1st: 2nd Lieut. A. Hunter, W. Rid. R., from a Flying Officer, and to be Temp. Lieut. whilst so employed; 2nd Lieut. L. S. Newns, S.R., from the 3rd Cl., and to be Temp. Lieut. whilst so employed.

3rd Class.—Jan. 10th: 2nd Lieut. J. A. Cowling, S.R.; 2nd Lieut. W. C. Clark, Gen. List; Temp. 2nd Lieut. J. O. Cooper, Gen. List; 2nd Lieut. Lord R. F. J. Camoys, Oxf. Yeo. (T.F.); Temp. 2nd Lieut. T. H. Cooper, Gen. List; Temp. 2nd Lieut. C. Channing, Gen. List. Jan. 15th: 2nd Lieut. (on prob.) R. F. P. Hocker, S.R.; Temp. 2nd Lieut. (on prob.) F. J. Standerwick, Gen. List.

Memoranda.—Capt. R. B. Neill, Res. of Officers, graded for purposes of pay as a Staff Capt., whilst employed as a Coy. Com., Cadet Wing, R.F.C.; Nov. 27th. The under-mentioned to be Temp. 2nd Lieuts.: Pte. H. J. W. McConnell, from a Divl. Ammn. Sub Park, for duty with R.F.C.; Aug. 17th.

Supplementary to Regular Corps.—The resignation of his commission by 2nd Lieut. (on prob.) H. Fuller-Clark, notified in the *Gazette* of the 21st Dec., 1916, is cancelled. The under-mentioned 2nd Lieuts. (on prob.) are confirmed in their rank: R. F. P. Hocker, O. L. Vetter, J. H. Secker, H. R. South. H. J. Birtles to be 2nd Lieut.; Jan. 12th. C. S. Collingwood to be 2nd Lieut. (on prob.); Jan. 18th.

London Gazette, February 2nd.

Staff Officers, 2nd Class (graded as Brigade Majors).—Dec. 16th: Capt. J. A. M. Lang, Notts. and Derby. R.,

from a Staff Capt.; Capt. N. J. Gill, R.A., from a Brig. Major. Lieut. (Temp. Capt.) F. C. Shelmerdine, Res. of Officers, from an Adjt., R.F.C.; Dec. 28th.

Group Commanders.—From Wing Commanders, and to be Temp. Cols. whilst so employed:—Jan. 1st: Major (Temp. Lieut.-Col.) H. C. T. Dowding, R.A.; Capt. (Temp. Lieut.-Col.) P. L. W. Herbert, Notts. and Derby. R.; Major (Temp. Lieut.-Col.) R. E. T. Hogg, C.I.E., 38th Central India Horse, Ind. Army.

Squadron Commanders.—From Flight-Coms., and to be Temp. Majors whilst so employed: Temp. Lieut. (Temp. Capt.) R. S. Maxwell, Gen. List; Dec. 18th. Temp. 2nd Lieut. (Temp. Capt.) G. B. Ward, M.C., Gen. List; Dec. 27th.

Flight-Commander.—Capt. J. H. C. Minchin, Sco. Rif., from a Flying Officer; Jan. 2nd.

Flying Officers.—Temp. Capt. J. H. Storey, S. Lan. R., and to be transfd. to Gen. List; Dec. 19th. Temp. 2nd Lieut. H. M. K. Brown, attd. Arg. and Suthd. Highrs., and to be transfd. to Gen. List; Dec. 20th. Dec. 23rd: Capt. E. H. Bedson, Lan. Fus. (T.F.); 2nd Lieut. G. G. Crutchley, Lond. R. (T.F.). Temp. 2nd Lieut. W. M. Roskelly, attd. W. York. R., and to be transfd. to Gen. List; Dec. 24th. Jan. 13th: Capt. C. P. Bertie, Lond. Brig., R.F.A. (T.F.); Lieut. J. McC. Elliott, Can. Gen. List. Temp. 2nd Lieut. (on prob.) C. L. Gunnery, Gen. List; Jan. 14th. Jan. 16th: Temp. 2nd Lieut. C. B. Fenton, Gen. List; Temp. Lieut. D. B. Davies, Welsh R., and to be transfd. to Gen. List; 2nd Lieut. P. D. Baker, Home Counties (Cinque Ports) Brig., R.F.A. (T.F.); 2nd Lieut. J. A. Loutit, Camb. R. (T.F.); Temp. 2nd Lieut. L. E. Vine, Gen. List; Temp. 2nd Lieut. D. Nelson, Gen. List.

Depôt Commanders.—Jan. 1st: From Park Coms., and to be Temp. Lieut.-Cols. whilst so employed: Major D. G. Conner, R.A.; Qmr. and Hon. Lieut. (Temp. Major) F. H. Kirby, V.C., R.F.C.

Park Commanders.—Temp. Lieuts. (Temp. Capts.) Army Ord. Dept., to be transfd. to Gen. List, and to be Temp. Majors whilst so employed:—Jan. 1st: L. P. Walker, W. H. Lang.

Equipment Officers, 1st Class.—Temp. Lieuts., Army Ord. Dept., to be transfd. to Gen. List, and to be Temp. Capts. whilst so employed:—Jan. 1st: G. Stevens, F. B. Pulham, H. J. Newton-Clare, R. G. L. Candy. 2nd Cl.: Temp. Lieuts., Army Ord. Dept. And to be transfd. to Gen. List:—Jan. 1st: F. J. Baker, V. E. Faning, G. W. Lee-Barber, L. G. T. Sedgwick, M. G. Dashwood, F. C. O. Shaw, C. H. Nathan, G. E. Morris, T. de la Poer Beresford, R. W. Seldon, L. G. Harber, W. B. Carnley.

3rd Class.—Lieut. D. T. W. Manwell, Australian Flying Corps; Nov. 18th. Temp. 2nd Lieut. H. C. Roberts, E. York R., and to be transfd. to Gen. List; Dec. 9th. 2nd Lieut. H. R. South, S.R.; Dec. 14th. Jan. 1st: Temp. Lieut. J. A. Stone, A. Ord. Dept., and to be transfd. to Gen. List; Temp. 2nd Lieut. G. H. Wilson, Gen. List; Temp. Lieut. H. L. Crichton, A. Ord. Dept., and to be transfd. to Gen. List; Temp. 2nd Lieut. (on prob.) B. G. White, R.E.; Temp. 2nd Lieut. (on prob.) B. W. M. Williams, A. Ord. Dept., and to be transfd. to Gen. List. Jan. 10th: 2nd Lieut. A. T. Griffith, S.R.; Temp. 2nd Lieut. (on prob.) C. J. Geddes, Gen. List; Temp. 2nd Lieut. (on prob.) R. G. Fussell, Gen. List; Temp. 2nd Lieut. (on prob.) F. Grattan, Gen. List; Temp. 2nd Lieut. A. Gane, Gen. List; Temp. Lieut. P. R. Garner, Gen. List; Temp. 2nd Lieut. (on prob.) J. G. Beckham, Gen. List; Temp. 2nd Lieut. (on prob.) G. E. Bower, Gen. List; Temp. 2nd Lieut. (on prob.) W. R. P. Allen, Gen. List; Temp. 2nd Lieut. E. E. Beaumont, Gen. List; Temp. 2nd Lieut. F. Briggs, Gen. List; 2nd Lieut. F. G. Buck, S.R.; Temp. 2nd Lieut. (on prob.) S. Frost, Gen. List; Temp. 2nd Lieut. (on prob.) E. R. Danks, Gen. List; Temp. 2nd Lieut. G. J. Enguell, Gen. List; Temp. 2nd Lieut. G. H. Etheridge, Gen. List; Temp. 2nd Lieut. E. C. Frisby, Gen. List; 2nd Lieut. W. S. Farley, S.R.; Temp. 2nd Lieut. F. E. Smyth, Gen. List; Lieut. M. Skitt, R.F.A., S.R.; Temp. 2nd Lieut. (on prob.) C. A. Stevenson, Gen. List; 2nd Lieut. J. H. Secker, S.R.; Temp. 2nd Lieut. D. C. Sutherland, Gen. List; Temp. 2nd Lieut. F. M. Thomas, Gen. List; Temp. 2nd Lieut. L. P. Timmins, Gen. List; Temp. 2nd Lieut. (on prob.) J. Watson, Gen. List; Temp. 2nd Lieut. (on prob.) L. E. Yeomans, Gen. List; 2nd Lieut. A. G. Stradling, S.R.; 2nd Lieut. O. L. Vetter, S.R.; 2nd Lieut. S. J. Vine, S.R.; 2nd Lieut. S. Wilson, S.R.; Temp. 2nd Lieut. (on prob.) H. McG. Wood, Gen. List; Temp. 2nd Lieut. (on prob.) S. Jolley, Gen. List; Temp. 2nd Lieut. (on prob.) F. P. Lambert, Gen. List; 2nd Lieut. C. Groves, S.R.; Temp. 2nd Lieut. A. Hodgkins, Gen. List; Temp. 2nd Lieut. A. Howard, Gen. List; 2nd Lieut. C. J. S. Holden, S.R.; Temp. 2nd Lieut. (on prob.) C. H. Mendham, Gen. List; Temp. 2nd Lieut. (on prob.) W. Le Lorraine, Gen. List; Temp. 2nd Lieut. (on prob.) N. Liddall, Gen. List; Temp. 2nd Lieut. R. Leake, Gen. List; 2nd Lieut. S. G. Linssen, S.R.; 2nd Lieut. F. D. Lugard, S.R.; 2nd Lieut. H. W. Prockter, S.R.; Temp. 2nd Lieut. R. Rainford, Gen. List; 2nd Lieut. J. D. Richards, S.R.; 2nd Lieut. R. Rochford, S.R.; 2nd Lieut. E. P. Proud, S.R.; Temp. 2nd Lieut. W. J. Rice, attd. Welsh R., and to be transfd. to Gen. List. Temp. Lieuts., A. Ord. Dept., and to be transfd. to Gen. List. Jan. 1st: W. E. Cowie, F. G. J. Didden, J. P. Ross, F. N. Downey, H. A. Whelen.

Memoranda.—Sub-Lieut. S. Wyborn, from R.N.V.R., to be Temp. Lieut. on Gen. List, for duty with R.F.C.:—Dec. 26th: The under-mentioned to be Temp. Lieuts. whilst serving with R.F.C. Jan. 1st:—2nd Lieuts.: E. A. Packe, Oxf. and Bucks. L.I.; F. Jefcoate, Suff. R.; D. G. B. Jardine, High. L.I.; J. Gilmour, Arg. and Suthd. Highrs.; W. L. Fenwick, Linc. R.; F. Egerton, 17th Lrs.; R. A. Denne, Wilts. R.; F. A. Coward, R.W. Surr. R.; A. I. Campbell-Robertson, 18th Hrs.; V. J. Whitaker, Linc. R., S.R.; R. D. Sampson, Worc. R., S.R. Temp. 2nd Lieuts.: G. E. Gibbs, Wilts. R., E. A. Worrall, H. G. Waterall, F. J. Terrell, M. L. Taylor, L. L. Richardson, C. T. Richards, J. W. Lawlor, R. V. Kann, F. P. Holliday, A. H. Gearing, A. D. Finney, G. R. A. Deacon, P. H. Davy, G. S. Bush, and H. D. Addis.

London Gazette Supplement, February 3rd.

Temporary Appointment at War Office.

Staff Lieutenant.—Temp. 2nd Lieut. D. Blairman, Gen. List, from an Equipment Officer, 3rd Cl., R.F.C., vice Lieut. N. C. F. Francis, R.F.C., S.R.; Jan. 4th.

Squadron Commander.—2nd Lieut. (Temp. Capt.) K. T. Dowding, R.W. Surr. R. (T.F.), from a Flight Com., and to be Temp. Major whilst so employed; Jan. 17th.

Flying Officers.—2nd Lieut. T. Elder-Hearn, S.R.; Dec. 19th. Jan. 14th: 2nd Lieut. B. King, Yorks. L.I., S.R., and to be secd.; 2nd Lieut. S. J. Stocks, S. Lan. R., S.R., and to be secd.; 2nd Lieut. A. C. Young, S.R.; Temp. 2nd Lieut. D. P. Collis, Gen. List; Temp. 2nd Lieut. J. W Brown, Gen. List; Temp. 2nd Lieut. A. I. Riley, Gen. List.

Adjutant.—Capt. S. O. Everitt, Res. of Officers; Jan. 6th.

Park Commanders.—From Equipment Officers, 1st Cl., and to be Temp. Majors whilst so employed: Qmr. and Hon. Lieut. (Temp. Capt.) S. J. Payne, R.F.C.; Jan. 1st. Lieut. (Temp. Capt.) F. S. Creswell, S.R.; Jan. 12th. Lieut. (Temp. Capt.) L. M. Bennett, S.R.; Jan. 26th.

Experimental Officer, 1st Class (graded as an Equipment Officer, 1st Class).—Temp. Lieut. H. T. Tizard, Gen. List, from a Flying Officer, and to be Temp. Capt. whilst so employed; Jan. 11th.

Memoranda.—The under-mentioned to be Temp. Lieuts. whilst serving with R.F.C.:—Jan. 1st: Temp. 2nd Lieut. L. A. Hardwick-Terry, R.E.; 2nd Lieut. O. T. Walton, S. Lan. R., S.R.; Temp. 2nd Lieut. F. L. Kitchin, attd. Glouc. R.; Temp. 2nd Lieut. J. G. Francis; Temp. 2nd Lieut. T. Shepard, attd. R. War. R. Acting-Sergt. R. B. Herring, from R.F.C., to be Temp. 2nd Lieut. (on prob.) for duty with the Mil. Wing of that Corps; Jan. 19th.

London Gazette Supplement, February 5th.

The under-mentioned to be Temp. 2nd Lieuts.:—

For Duty with R.F.C.—Corpl. M. Lewis, from R.E. Jan. 10th. Jan. 14th: Pte. A. D. Collins, from Lond. R. (T.F.); Pte. H. J. Bennett, from Can. A.S.C.

Wing Commanders.—From Sqdn. Coms., and to be Temp. Lieut.-Cols. whilst so employed:—Dec. 18th: Major A. B. Burdett, D.S.O., York and Lanc. R.; Capt. (Temp. Major) W. G. S. Mitchell, M.C., High. L.I. Capt. (Temp. Major) H. Le M. Brock, D.S.O., R. War. R.; Dec. 27th. Capt. (Temp. Major) E. N. Fuller, S.R.; Jan. 2nd.

Flying Officers.—Dec. 28th: 2nd Lieut. H. N. Loch, 8th Gurkha Rif., Ind. Army; Temp. 2nd Lieut. G. A. Cocks, Garr. Bn., Ches. R., and to be transfd. to Gen. List. Dec. 29th: 2nd Lieut. W. J. Gayner, Som. L.I. (T.F.); Temp. 2nd Lieut. C. P. Lowry, Gen. List Dec. 31st: Temp. 2nd Lieut. G. Le B. Diamond, attd. Essex R.; 2nd Lieut. (on prob.) D. Mitchell, Sco. Rif., S.R., and to be secd.; 2nd Lieut. L. H. Forrest, 47th Sikhs, Ind. Army; 2nd Lieut. W. A. Coates, Australian F.C.

Balloon Officers.—2nd Lieut. T. G. Beale, 2nd Dn. Gds., and to be secd.; Oct. 27th. 2nd Lieut. J. R. Hembrough, S.R., from an Equipment Officer, 3rd Cl.; Dec. 19th. 2nd Lieut. F. S. Young, R. Suss. R. (T.F.); Dec. 30th. Temp. 2nd Lieut. J. R. Newland, attd. Gord. Highrs.; Jan. 2nd.

Depôt Commander.—Capt. (Temp. Major) A. Christie, R.A., from a D.A.Q.M.G., and to be Temp. Lieut.-Col. whilst so engaged; Dec. 19th.

Park Commander.—2nd Lieut. (Temp. Capt.) C. G. Smith, S.R., from an Equipment Officer, 1st Cl., and to be Temp. Major whilst so employed; Dec. 26th.

Equipment Officers, 1st Class.—From the 2nd Cl., and to be Temp. Capts. whilst so employed: Temp. Lieut. A. S. Ellerton, Gen. List; Dec. 19th. Lieut. W. H. Day, Hamps. R.; Dec. 30th. Jan. 1st: 2nd Lieut. (Temp. Lieut.) G. I. N. Deane, Tyne Electrical Engrs., R.E. (T.F.), from the 2nd Cl., and to be Temp. Capt. whilst so employed. From the 2nd Cl., and to be Temp. Capts. whilst so employed: 2nd Lieut. (Temp. Lieut.) S. Davenport, S.R.; Temp. Lieut. J. W. Burt, Gen. List; Temp. Lieut. J. R. Grant, Gen. List; 2nd Lieut. (Temp. Lieut.) J. L. Luntley, S.R. Temp. Lieut. T. F. G. Strubell, Gen. List, from a Special Appt. (graded as an Equipment Officer, 2nd Cl.) and to be Temp. Capt. whilst so employed; Jan. 9th. 2nd Lieut. C. R. Huggins, S.R., from the 3rd Cl., and to be Temp. Capt. whilst so employed; Jan. 13th.

2nd Class.—Temp. Capt. L. Sadler, A.S.C., from a Staff Capt.; Jan. 1st. From the 3rd Cl.: Temp. Lieut. H. B. Denton, Gen. List; Jan. 9th. Lieut. B. V. Grealy, S.R.; Jan. 10th.

3rd Class.—2nd Lieut. F. T. McElwee, Gen. List; Jan. 1st. Jan. 10th: Temp. 2nd Lieut. (on prob.) L. A. Owen, attd. Hamps. R.; 2nd Lieut. A. R. Mitchell, S.R.; 2nd Lieut. S. A. Mitchell, S.R.; 2nd Lieut. W. G. Murray, S.R.; 2nd Lieut. L. S. Pape, S.R. Jan. 17th: 2nd Lieut. C. Cadman, Yorks. Dns. Yeo. (T.F.); Temp. 2nd Lieut. S. T. Fradd, Gen. List.

Experimental Officers, 2nd Class (graded as an Equipment Officer, 2nd Class).—2nd Lieut. F. A. Harper, S.R., from the 3rd Cl., and to be Temp. Lieut. whilst so employed; Jan. 1st.

3rd Class (graded as an Equipment Officer, 3rd Class).—2nd Lieut. H. H. Chivers, S.R.; Dec. 4th.

Special Appointment (graded as an Equipment Officer, 2nd Class).—2nd Lieut. H. G. Gold, S.R., from an Equipment Officer, 3rd Cl., and to be Temp. Lieut. whilst so employed, vice Temp. Lieut. T. F. G. Strubell, Gen. List; Jan. 9th.

Memorandum.—2nd Lieut. (on prob.) W. H. A. Heald, R. Fus. (S.R.), to be Temp. Lieut. whilst serving with R.F.C.; Jan. 1st.

Schools of Instruction.

London Gazette, January 30th.

Instructor (graded as a Squadron Commander).—Capt. J. V. Steel, R.A., a Flight-Com.; Jan. 11th.

Aeronautical Inspection Department.

London Gazette Supplement, February 5th.

2nd Lieut. (on prob.) H. H. Leage, from R.F.C., S.R., to be Temp. Lieut. on Gen. List (without Army pay and allowances) whilst employed as an Asst. Inspr., Aeronautical Inspecn. Dept., Dec. 13th.

Royal Flying Corps (Territorial Force).

London Gazette Supplement, February 1st.

Major S. Heckstall-Smith to be Temp. Lieut.-Col.; Sept. 1st.
Sergt.-Major J. S. Irving to be Lieut. (Temp.); Feb. 2nd.

AIR FIGHTING IN 1917.

A GRAPHIC little pen-picture of air fighting at the present time is contained in an article written by Lord Northcliffe, at the special request of the United Press Association of America. He says:—

"Very rarely do the Germans venture over our lines, and one has to be very far forward nowadays to get a good view of a fight between the Allies and the enemy in the air. I have had that good fortune several times. Air fighting in 1914 bears as much resemblance to air fighting in 1917 as an old steam automobile to a six-cylinder of to-day. There is a perpetual match in speeding up between the enemy and the Allies. Four or five miles an hour extra pace means everything. It is not the increase of engine power to over 200 h.p. that has brought about the change so much as the wonderful progress of the art of flying itself, and it is just here that the Anglo-Saxon and the Frenchman beat the slower-minded German. It is just this reason why the German soldiers' letters are now so full of complaint about the over-cautious German airman.

"When Pégoud invented looping the loop people asked, 'Why? What is the use of it?' Pégoud was a very considerable inventor as well as a flyer, is the answer. Looping the loop is a useful manœuvre, and it has been succeeded by that extraordinary development, the nose dive, in which the airman seems to fall like a stone for thousands of feet, till the spectator's hair rises from his head in horror. Suddenly the machine flattens out, scoots away, and you find that it is only a trick after all. I talked with one of our wounded boys—he was just 19—who had fallen 8,000 ft. owing to his rudder wire connection being shot through. By a miracle his machine straightened itself out automatically within a hundred yards of the ground, and the boy is alive and will fly again. I asked him his sensations; he is probably the only man in the world alive who has fallen 8,000 ft.—more than 10 times the height of the Woolworth Building, New York City, 750 ft. He said that for a long time—what seemed like hours—he knew that he was falling, and falling at a tremendous speed, and then he lost consciousness, as in a dream, and found himself being picked up out of the wreck of his machine by people who thought that he was dead.

"At the beginning of an air fight there is manœuvring for position and feinting as in boxing. There are, as a rule, two men in each machine—a pilot and an observer—except in the smaller types, in which the wings are clipped down to nothing to get extra speed and climbing power. Knowledge of engine and plane power, quickness of decision, and accuracy of shooting with the Lewis gun are essential to the pilot. His observer is provided with some form of pistol and often with bombs.

"The rival planes, like giant hawks, hover around, above, or below each other, till one more expert or more daring than the other manœuvres his opponent into a position from which he has either got to fight or flee. The knock-out blow is usually a sudden descent on the enemy, accompanied by accurate machine-gun fire. Sometimes it becomes a duel with Browning pistols, in which the men are so close that they can each see other's eyes. The thing is over before you realise it. One machine is off and away, and the other whirls and crashes down, down, down to earth.

"The British Army does not permit the names of its flying heroes to be published. In telling you, therefore, of the American flyers, I must deal with those Americans with the French Army.

"Lieutenant Thaw, of Pittsburg, was one of a number of Americans who entered the famous Foreign Legion of the French Army on the outbreak of war, and is the senior American flying officer in France. His name and that of his colleagues are better known in Europe than in their own country.

"In giving a list of those whose names are known (some, alas! are lying beneath the wooden cross) I can say no more than that they are worthy representatives of a great nation.

"Lieutenant Thaw was followed by Bert Hall, from Texas, James Bach, D. Masson, Givas Lufbery, James McConnell, of Chicago, Chouteau Johnson, of New York, Elliot Cowdin, Kiffin Rockwell, Clyde Balsley, of Texas, Dudley Hill, of Peekskill, New York, and Victor Chapman.

"The policy of the American airmen serving with the French Army is that of the British and French—to attack. They have played a goodly part in the invention of the constantly changing tactics of air fighting."

Lectures at Cardiff.

IN conjunction with the Aeronautical Society of Great Britain, the Cardiff Technical College has arranged for a series of ten lectures to be given at the College on Saturday evenings, commencing, it is hoped, on February 24th. The lectures will include the history and development of aviation, the modern aeroplane, materials, design, meteorology, navigation, aero engines, airships, &c., and the lecturers will include some of the leading experts. The cost of the lectures is being borne by a resident of Glamorgan.

An Australian Biplane.

SOME particulars of a biplane built in Australia by Mr. Basil G. Watson, an old pupil of the Hall Flying School, are just to hand. The machine, which is on tractor scout lines, has a span of 26 ft. and is 18 ft. in length. Tasmanian bass and mountain ash are the timbers utilised in the construction, while the propeller is of Queensland walnut. The engine is a 50 h.p. Gnome. Mr. Watson made a flight of 45 mins. at Melbourne in November, and later gave some exhibition flights at Bendigo.

Personals

Casualties.

Lieutenant GODFREY B. J. FIRBANK, R.F.C., aged 22, eldest son of Mr. and Mrs. Godfrey Firbank, of Aldwick Court, Wrington, Somerset, who has been missing since September 11th, is now reported to have been killed, the American Embassy, Berlin, stating that his machine was shot down in an air battle on that day, the aeroplane wrecked, and the occupants killed. Lieutenant Firbank was educated at St. Peter's, Weston-super-Mare, and at Clifton College. When war broke out he was farming in South Africa. He at once joined the Eastern Rifles, and served during the rebellion in South Africa and with General Botha's Army in German South-West Africa. When the campaign ended he came home, was gazetted to the Welsh Regiment, and at the end of December, 1915, transferred to the Royal Flying Corps.

Second Lieutenant GILBERT S. HALL, R.F.C,, only son of Mr. and Mrs. Robert Hall, of Greenaleigh, Matlock, died of wounds in an enemy hospital at Cambrai, on November 30th last. Born in 1891, he was educated at Mill Hill School, and was a graduate of the Institution of Mechanical Engineers. He joined the Royal Flying Corps in November, 1915, and after training went to the front in May, 1916. While on patrol work his machine was shot down, the observer being killed at once. Lieutenant Hall died of his injuries ten days later. He was well known in motoring circles.

The Rev. J. Stewart, Erskine U.F. Church, Chirnside, has received information that his son, Lieutenant STEWART, R.N.A.S., has been killed in action.

Second Lieutenant STANLEY W. WOODLEY, R.F.C., whose death is announced, was the only child of Mr. W. S. Woodley, of Erskine Hill, Hendon, N.W. Second Lieutenant Woodley, who received his commission in November, 1915, went to the front in July of last year. He had received mention in despatches. He was a promising young architect and surveyor, a probationer of the Royal Institute of British Architects, and served under the late Mr. G. L. Sutcliffe, F.R.I.B.A., architect to Copartnership Tenants (Limited), Hampstead Garden Suburb.

Captain (temporary Lieutenant-Colonel, R.F.C.) GEORGE AUBREY KENNEDY LAWRENCE, D.S.O., Royal Field Artillery, who was killed while flying in England on January 28th, was 25 years of age and the youngest son of Major-General W. A. Lawrence and Mrs. Lawrence, of Pembroke Gardens, Kensington, late of Sandhurst, Berkshire. Captain Lawrence passed out of Woolwich into the Royal Artillery in December, 1911, and in September, 1914, he was attached to the Royal Flying Corps; he was gazetted Captain in the Royal Artillery in August, 1916, and was Major in the Royal Flying Corps in the same year. He had served with great distinction in the war, and his award of the D.S.O. was gazetted in November, 1915, in the following terms: "For conspicuous and repeated acts of gallantry in France, notably the following: On September 21st, 1915, he completed a reconnaissance to points 60 miles inside the German lines, although repeatedly attacked by a hostile machine. On September 25th he attacked and hit a moving train near Lille, descending to 600 ft. On September 26th he attacked and drove off a hostile aeroplane which was interfering with our bombing machines. On September 30th he carried out a three-hour reconnaissance in very bad weather. Although his machine was hit in 70 places by anti-aircraft guns on crossing the German lines on his way out, he carried on and completed his work." He was received by the King at Buckingham Palace on December 9th, 1915, and was invested with the Insignia of the Companionship of the Distinguished Service Order.

Missing and Prisoners of War.

Flight Lieutenant SYDNEY ALDER, R.F.C., who has been reported missing, is the elder son of the late Mr. Sydney Alder, and grandson of the late Mr. Gilbert Alder and of Mrs. Alder, of Hargrave, Stansted, Essex. He formerly held a commission in the Sherwood Foresters, and was wounded at the Battle of Loos.

Captain PHILIP HUNT, Shropshire Yeomanry, attached R.F.C., previously reported missing, is now reported to be wounded and a prisoner in German hands.

Married and to be Married.

Flight Sub-Lieutenant MICHAEL BIRKBECK, R.N., son of the late Mr. William John Birkbeck, of Stratton Strawless, Norwich, was on February 3rd at St. Barnabas' Church, Pimlico, married to LETTIE, only daughter of Mr. and Mrs. HUGH ELLIOT, of Byfleet, Surrey.

Captain A. R. STANLEY CLARKE, M.C., Dorest Regiment, attached R.F.C., only son of Mrs. and Mrs. C. H. Stanley Clarke, of Berghmote, Wimborne, was on January 31st, at Almondsbury, married to MARJORIE, elder daughter of Mr. and Mrs. HIATT BAKER, of Oaklands, Almondsbury.

EDMUND WILFRID SHARPE, Yeomanry, attached R.F.C., second son of Mr. Edmund Sharpe and Mrs. Sharpe, of Halton Hall, Lancaster, was married at Christ Church, Ealing, on January 27th, to ELEANOR ALICE, "NOREEN," eldest daughter of Mr. W. H. PERSSE and Mrs. PERSSE, 44, Craven Avenue, Ealing.

The marriage arranged between Captain A. F. SOMERSET-LEEKE, R.F.C., and Miss WINIFRED R. HELDER, of Lyndhurst, Whitehaven, will take place at St. John's Church, Hensingham, Whitehaven, on February 19th, at 11.45 a.m.

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Fatal Accidents.

AT the inquest at Farnborough on January 26th on 2nd Lieut. P. Evans, R.F.C., the evidence appeared to show that the pilot attempted to make a sharp left turn when the machine was climbing too steeply. From 500 ft. the machine nose-dived for 200 ft. and then started to the left, apparently out of control. The engine was still running when the machine struck the ground, and the wreck caught fire. A verdict of "Accidental Death" was returned.

A similar verdict was returned at the inquest on January 30th on Major F. W. Goodden. The Coroner said that Major Goodden's death was a loss not only to the country, but also to the Royal Flying Corps and the Royal Aircraft Factory. He was one of the best pilots in the service, second to none. He knew him personally as a friend. On many occasions he had been before them for the purpose of giving expert evidence in flying accidents, and now he had met his own death. Mr. Henry Fowler, Superintendent of the Royal Aircraft Factory, said he would like to express the same thoughts as the Coroner had done as to the great loss they had sustained by the death of Major Goodden. Lieut.-Col. Heckstall-Smith said it was the duty of deceased to test every new type of machine turned out from the factory, and he took the first risk. Witness considered the machine—which deceased had flown over to France—thoroughly satisfactory. It was stated that after being in the air for about 15 minutes the machine was seen to make a left and right turn at a height of about 1,000 to 1,500 ft., and then started on a gradual left turn. The planes on the left side appeared to collapse, the machine side-slipped for about 150 ft. and then nose-dived practically vertical to the ground with the wings folded up. The machine struck the ground and was completely smashed; there was no fire.

Another inquest was held on January 30th on 2nd Air-Mech. B. Hodgson, who had died early the same morning from injuries received on the previous day. It appears that a machine piloted by Lieut. Crossfield left the aerodrome at Farnborough, but did not rise quick enough, and the pilot, fearing he would foul some trees, banked the machine so steeply that it side-slipped. The deceased was pinned under the wreck and died from a fracture to the skull. The pilot was severely injured. A verdict of "Accidental Death" was returned.

"Death from Misadventure" was the verdict at an inquest held on January 25th on Flight-Sergt. J. B. Hartnell, who was killed in an accident in Kent. It was stated that the machine on which deceased was a passenger lost flying speed and made a nose-dive from about 500 ft.

At an inquest on 2nd Lieut. H. N. Sharpe, R.F.C., held on January 30th, it was stated that while flying at a height of about 500 ft. he made a right-hand turn which was flat and in insufficient bank. The result was that the machine spun and then fell straight to the ground, the officer being killed instantly. The wreckage, when examined, disclosed no evidence of the controls being jammed or any defects in the machine. A verdict of "Accidental Death" was returned.

AIRCRAFT WORK AT THE FRONT.

OFFICIAL INFORMATION.

British. *General Headquarters, January 30th.*

"Successful bombing operations were carried out by our aeroplanes on the night of the 28th–29th inst., and again yesterday. In the course of air fights three German machines were destroyed yesterday and three others driven down damaged."

General Headquarters, February 2nd.

"Clearer weather led to increased activity in the air yesterday, and much useful work was done by our aeroplanes. Four of our machines are missing."

War Office, February 3rd.

"*Mesopotamia.*—On the morning of the 1st one of our aeroplanes shot down a Fokker, which crashed to the ground from a height of 7,000 ft. We also sank two pontoons crossing the River Tigris."

General Headquarters, February 5th.

"Three German aeroplanes were destroyed yesterday as the result of air fighting, and six others were driven down damaged. One of our machines is missing."

French. *Paris, January 30th.*

"Yesterday three German machines were brought down in air fights by our pilots, including one by Sergt. Hauss, who has up to the present brought down five German machines. It is confirmed that Warrant Officer Jailler has brought down up to now six enemy aircraft (five aeroplanes and one observation balloon).

"During the night of Jan. 29th–30th our aeroplanes bombarded bivouacs in the environs of Etain, the military factories of Ham, the stations and factories of Polembray, and the stations of Athies, Hombleux and Curchy."

Paris, January 31st.

"According to supplementary reports, it is confirmed that a German machine which was described as having been seriously damaged yesterday was actually brought down north-east of the Bois d'Hallu."

Paris, February 1st.

"Warrant Officer Maden brought down yesterday his fifth German machine. Last night one of our air squadrons bombarded the railway stations and enemy depôts of Curchy and Voyennes and the bivouacs east of Nesle. One of our aeroplanes, armed with a gun, fired about fifty shells on enemy cantonments at Mesnil Saint Nicaize and Herly (Somme)."

Paris, February 2nd.

"Yesterday, in the daytime, a German aeroplane dropped five bombs on Dunkirk. The damage done was insignificant, and nobody was hurt."

Paris, February 4th.

"Our bombarding aeroplanes dropped numerous bombs on the hutments and railways at Appilly and Tergnier. One of our squadrons bombarded the military factories of Thionville (Diedenhofen)."

Paris, February 5th.

"On the night of February 2nd-3rd, and last night, our air squadron bombarded the aerodrome of Colnar (Alsace), the military factories of Rombach, and the railway stations of Chauny, Ham, and Appilly. A fire was seen to break out among the buildings of the last-mentioned station."

Russian. *Petrograd, January 31st.*

"On Jan. 30th a Zeppelin passed rapidly over the town of Gainach, on the coast of the Gulf of Riga, in a north-easterly direction, and surveyed the locality by means of a searchlight."

Petrograd, February 1st.

"One of our aviators was engaged in combat with an enemy aviator. German aviators have bombarded the region of the village Teplya (13½ miles north-east of Postav)."

Petrograd, February 4th.

"A German aeroplane dropped bombs on Rodenpolis Station (north-east of Riga) without causing any damage."

Petrograd, February 5th.

"A German aeroplane which was bombarded by our fire rapidly descended into the enemy's lines north-west of Postavy."

German. *Berlin, February 2nd.*

"On Thursday afternoon one of our naval battle aeroplanes (a one-seater) shot down an enemy battle aeroplane (a one-seater) off the Flanders coast. The enemy machine fell into our hands, and the airman, a British naval lieutenant, was captured."

Berlin, February 5th.

"On Friday evening several of our Flanders naval aeroplanes lavishly pelted Furnes and Dunkirk with bombs. The aeroplanes returned safely."

Bulgarian. *Sofia, January 29th.*

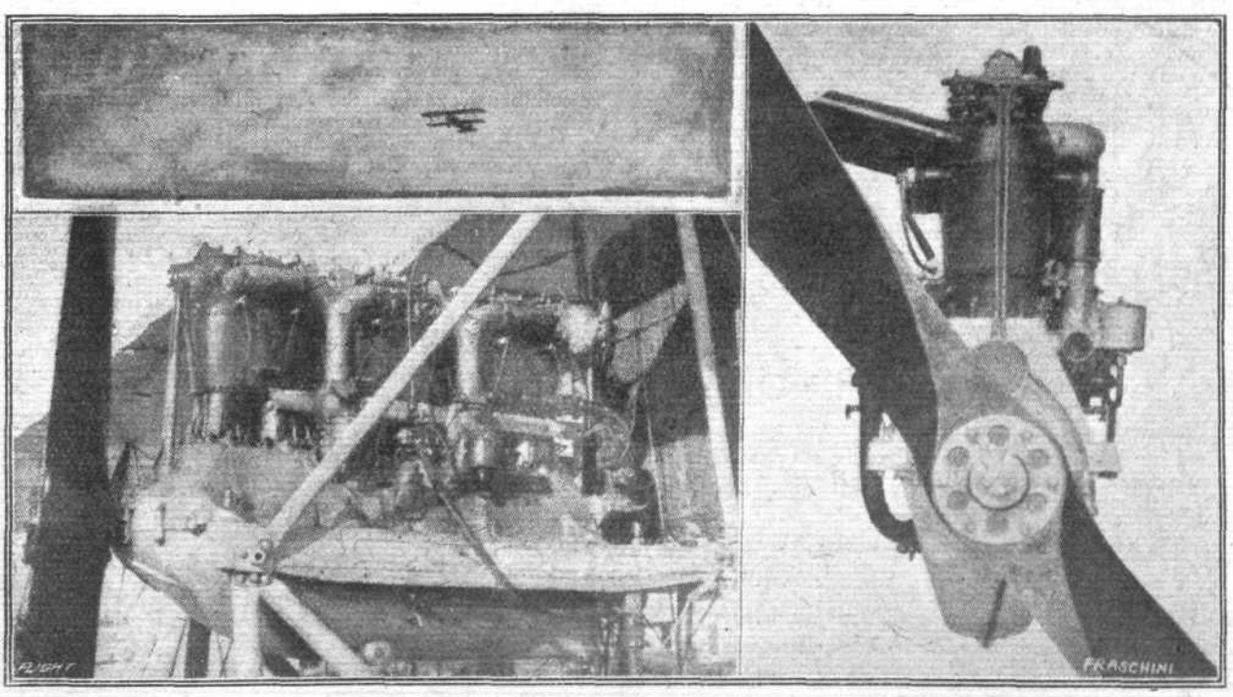
"There was aeroplane activity over Seres, and encounters took place between patrols."

Sofia, February 3rd.

"Great aerial activity."

Turkish. *Constantinople, January 26th.*

"After an obstinate aerial combat in the neighbourhood of Kut-el-Amara, Sergt. Jopp, in spite of the enemy's superiority, succeeded on Jan. 11th in bringing down an enemy aviator and in forcing a second to descend to earth. A third was seen to have been hit, but succeeded in escaping. There is nothing to report on the other fronts."



Two views of the Italian Isotta-Fraschini aero engine. There are two models of these engines in use, a 150 h.p. and a 200 h.p., weighing 1,200 lbs. and 1,600 lbs. respectively.

SOME PROBLEMS IN AEROPLANE CONSTRUCTION.

By CAPT. V. E. CLARK, CAPT. T. F. DODD, and O. E. STRAHLMANN.

(*Concluded from page 121.*)

APPENDIX.

IN calculating the values used in plotting the performance curves, Figs. 4 and 5, the weight of machine was assumed as 1,150 lbs., and the engine was assumed to develop 140 b.h.p. The lifting power of a wing is given by $L = K_y AV^2$, where L is the lift, K_y the lift coefficient (which varies for different altitudes of the wing to the relative wind and must be determined by experiment), A is the area of the wings and V the air speed. Similarly the resistance of a wing is

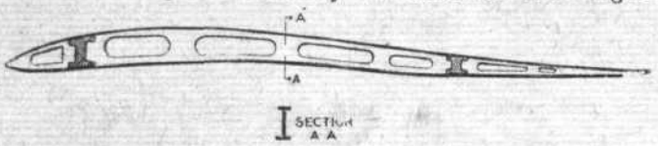


Fig. 6.—Rib used in present type of wing construction.

expressed by $D = K_x AV^2$, K_x being a variable coefficient that must be found by experiment. The speed at which the aeroplane must fly for any assumed angle of attack can be found from the lift formula. The lift in all cases, of course, is assumed to be the weight of the aeroplane. The resistance of the wings at these speeds can then be determined and the total resistance found by adding the parasite resistance, that is, the resistance of the body, landing gear, &c. From the total resistance the horse-power required can be calculated and plotted against speed. The horse-power available is obtained by multiplying the efficiency of the propeller by the brake horse-power delivered by the engine.

The ribs as ordinarily used in the present type of wing construction are as shown in Fig. 6. The weight of such a

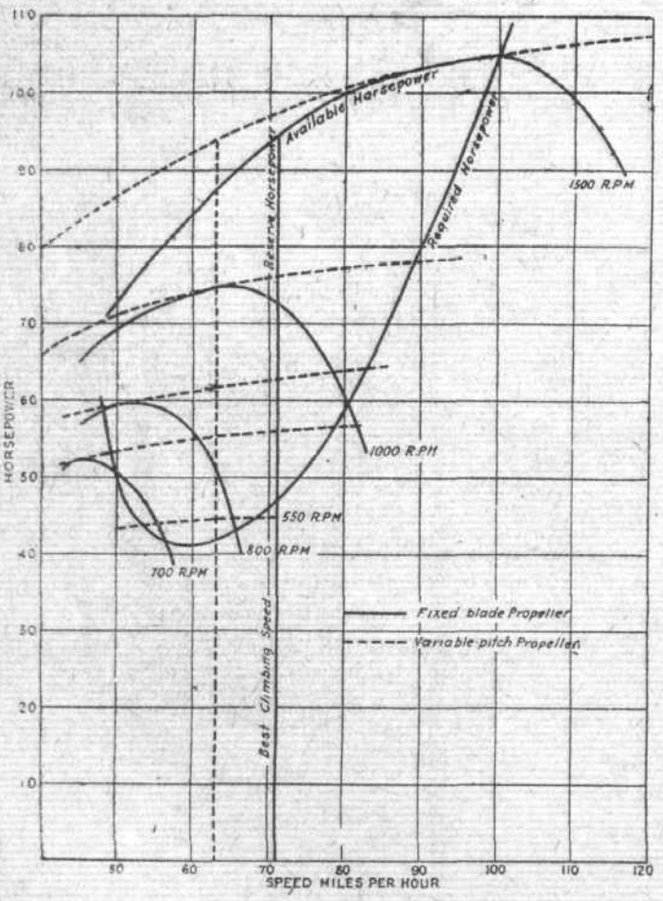


Fig. 7.—Performance curves for reconnaissance type of aeroplane.

rib for a small pursuit machine, as assumed in the above calculations, would be less than ½ lb. The ribs would be spaced from 12 to 15 ins. along the spars. A wing complete with cover, internal bracing, &c., weighs from 0·6 to 0·7 lb. per square foot.

Propellers with variable-pitch angle.—Improved performance of an aeroplane, especially as regards radius of action, can be brought about by means of a propeller whose pitch angle can be varied by the pilot while in flight. The liability of failure, the complexity of the mechanism and the weight added, must be weighed against the gain obtained in the performance. The gain in efficiency of the variable-pitch-propeller over the fixed-blade type is considerable. This increased efficiency makes available more horse-power for climbing, giving faster climbing, and permits throttling down to attain the economical speed, and hence increases the flight radius and the time in the air with a given quantity of fuel. These facts are more clearly brought out by the approximate curves given in Fig. 7, which give the horse-power required and horse-power available at various speeds for a fast reconnaissance type of aeroplane of refined design. The full lines give the power available for a fixed-blade propeller; the dotted lines for a variable-angle blade. It is assumed

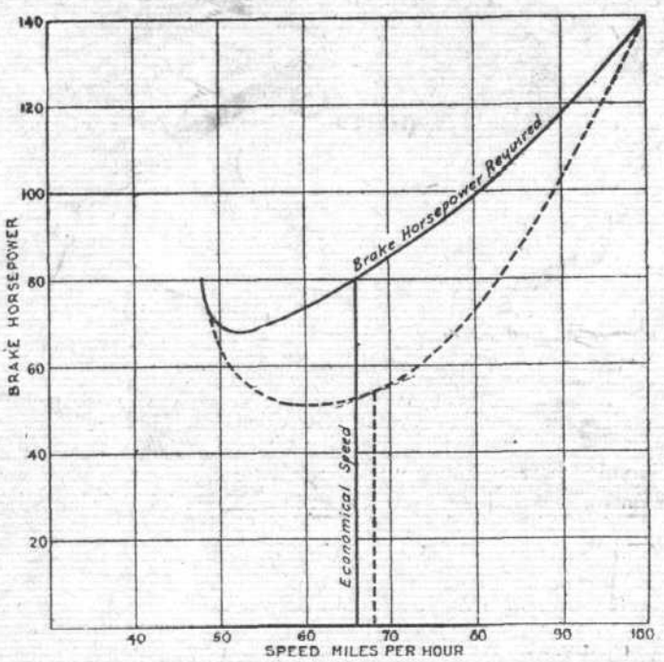


Fig. 8.—Showing economical speeds of aeroplanes with fixed-blade (full lines) and variable-blade (dotted lines) propellers.

that the propeller was designed for maximum efficiency at the high speed of the aeroplane. The most evident gain made by using the variable pitch as observed from the curves is the increased reserve horse-power available for climbing. This particular assumed aeroplane, with full load, climbs:—With fixed blade, 650 ft. the first minute; with variable-pitch blade, 715 ft. the first minute. The increase in the radius of action is very great, the greatest radius of action being obtained when flying at the economical speed of the aeroplane. Fig. 8 shows the economical speed in each case. On one filling of the gasoline tanks the fixed blade would carry the machine about 690 miles in 10½ hours. The variable-pitch blade would carry the same machine a distance of about 1,050 miles in 15½ hours. (Were this machine driven at full power it could go but 600 miles with either propeller.) These curves, while only approximate, will at least give some indication as to the value of a variable-angle propeller, especially where great distances are to be covered. The greater efficiency of the variable pitch would be of value in giving increased climbing ability at high altitudes and the possibility of reaching greater heights with a given machine. Another feature possible, of secondary importance, in a variable-pitch blade is that it can be rotated to give a large negative angle of attack, or possibly reversed, when the aeroplane is on the ground making a landing, thus serving as a brake and cutting down the distance the machine rolls on the ground.

APPENDIX.

The weight of assumed aeroplane fully loaded is 2,400 lbs. The brake horse-power of engine is as given in Fig. 11. The fuel capacity is 6 hours at full power. If A denotes the angle that the helix line makes with the base line, Fig. 9, V the translational velocity in feet per second and N the propeller speed in revolutions per second, then the distance advanced each revolution, neglecting slip, is (V ÷ N) feet, which is the

effective pitch of the propeller. Suppose the chord XY of the blade section at any radius V, makes an angle *a* with the helix line, Fig. 9. Angle *a* is called the angle of attack of the section. As (V ÷ N) changes owing to a variation in either V or N, or in both, the blade section will have a varying angle of attack, an increase in (V ÷ N) decreasing

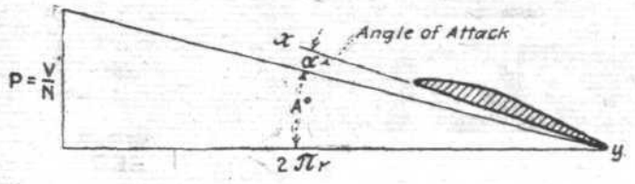


Fig. 9.—Showing pitch angle of propeller.

the angle of attack and *vice versa*. The efficiency of such an element is expressed by

$$e = \frac{\tan A}{\tan (A + G)}$$

where G is the gliding angle, which is a function of the angle of attack and varies with the type of section employed

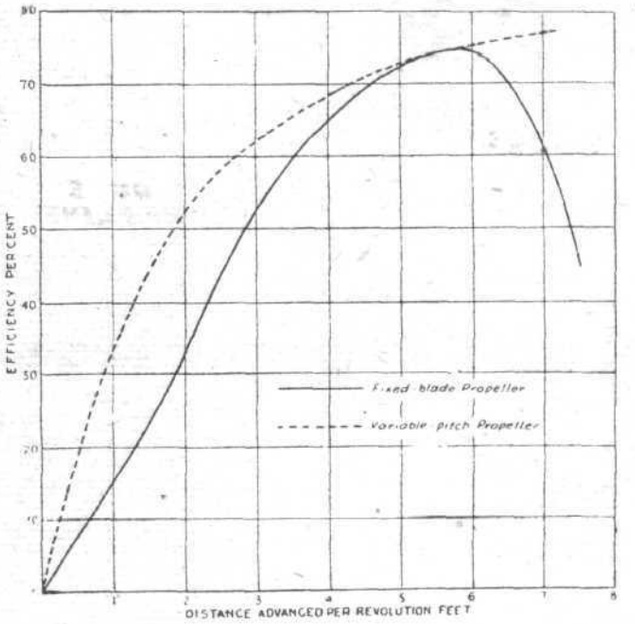


Fig. 10.—Relation of propeller efficient and effective pitch.

With the usual section used in propeller design G is a minimum when the angle of attack is about 4°. It would, therefore, be advantageous from the viewpoint of efficiency of the section to keep the angle of attack at 4° throughout the speed range of the aeroplane. This can be accomplished by means of a flexible blade whose pitch angles could be changed a varying amount from the tip of the blade to the

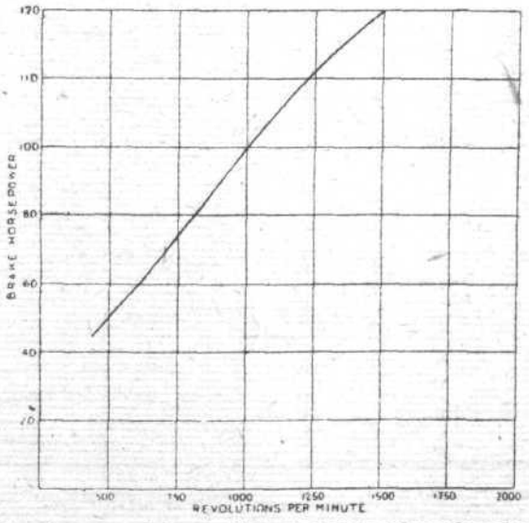


Fig. 11.—Assumed brake horse-power of engine driving variable-pitch propeller.

root or hub section. Such a blade is out of the question in the light of present-day practice. A good approximation to such a blade could be more simply had by rotating the blade about its axis perpendicular to the shaft. With the usual type of section employed the approximation is good, as the value of G does not change greatly for a degree or so on either side of the best angle of attack. A mean value for the angle of attack could, therefore, be found giving practically the same efficiency as though all the sections were at the best angle of attack. Fig. 10 shows curves in which efficiency of a propeller is plotted against (V ÷ N). The full line gives the efficiency for a fixed blade, the dotted line the efficiency of the same blade were the angle of attack kept at approximately 4°. It is assumed that the fixed-blade propeller was designed for a maximum efficiency at a value of (V ÷ N) of about 6 ft.

PROPELLER STRESSES.

In connection with the subject of propellers, it may be of interest to give a brief review of the variation of stress that occurs in a propeller blade under an assumed condition of

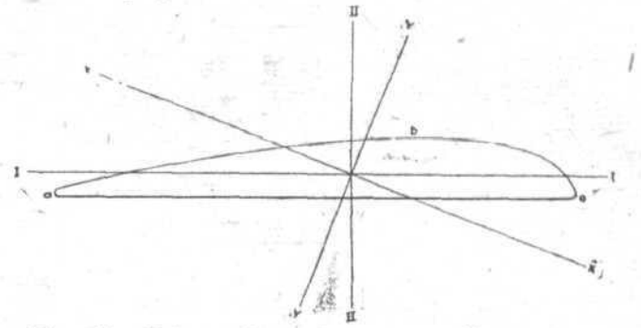


Fig. 12.—Points of maximum propeller stress.

flight. The blades of a propeller are subject to the following stresses when an aeroplane is in any but a straight-line flight :—

1. Shear due to aerodynamical forces.
2. Torsion due to the distance between the centre of gravity of the blade section and the point of application of the resultant of the air reactions.
3. Tension due to centrifugal force.
4. Steady bending due to aerodynamic forces ; torque and thrust imposing a distributed load on the blade, the hub being the fixed point of support.
5. Reverse bending due to gyroscopic forces, which occur only when the aeroplane has rotation about an axis, as in making a turn or pulling out of a dive. As a matter of fact, an aeroplane is continually turning to some extent if the flight be in disturbed air. Each of these forces produces a maximum stress of tension and compression in different parts of the blade, hence the resultant fibre stress at any point will be equal to the algebraic sum of the individual stresses at that point. It is sufficient to calculate the stress at the

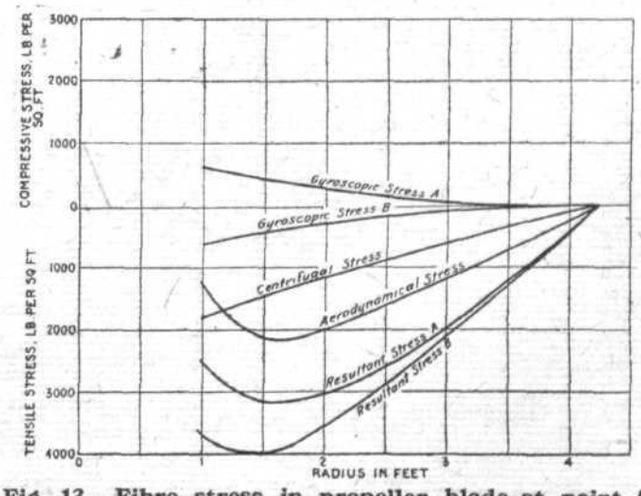


Fig. 13.—Fibre stress in propeller blade at point A (see Fig. 12).

points *a*, *b*, *c* (Fig. 12) along the blade, as these points will be those of maximum stress. The shear in any case is small and can be neglected in design. The torsion is also small. In good designs, when the thrust is great, the point of application of the air reactions is but little removed from the

axis passing through the centre of gravity of the section. The curves of stress given are for a three-blade propeller of about 8½ ft. diameter, 5 ft. pitch, absorbing 150 h.p. at 1,300 r.p.m. The curves are not accurate, as they are intended merely to give a general idea of the order of magnitude of the stresses likely to occur in such a propeller. The stress caused by centrifugal force is uniform over any section of the blade and varies in intensity at points along the blade, as shown approximately in Figs. 13, 14 and 15. Steady bending due to aerodynamic forces is caused by torque and thrust. These forces act along X – X and Y – Y, respectively for any section, such as shown in Fig. 12. When resolved along I – I and II – II they induce bending moments that cause the fibre stress as shown in Figs. 13, 14 and 15. Gyroscopic moments are only induced when the aeroplane is changing its direction of flight. In order to estimate the stress set up in the blades an assumption must be made as to the angular velocity of the propeller axis;

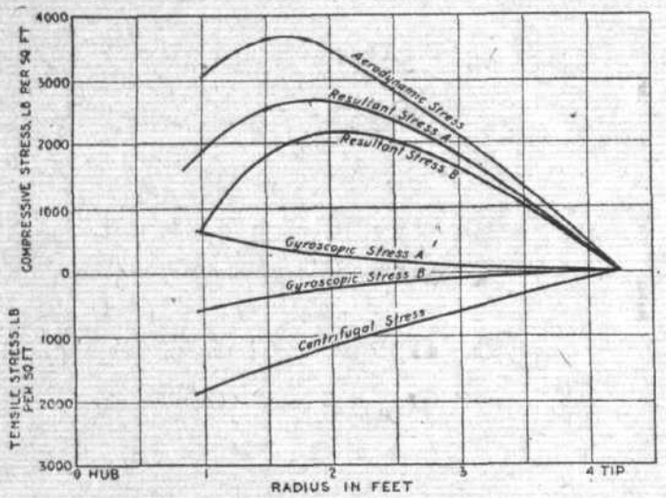


Fig. 14.—Stress in propeller blade at point B (see Fig. 12).

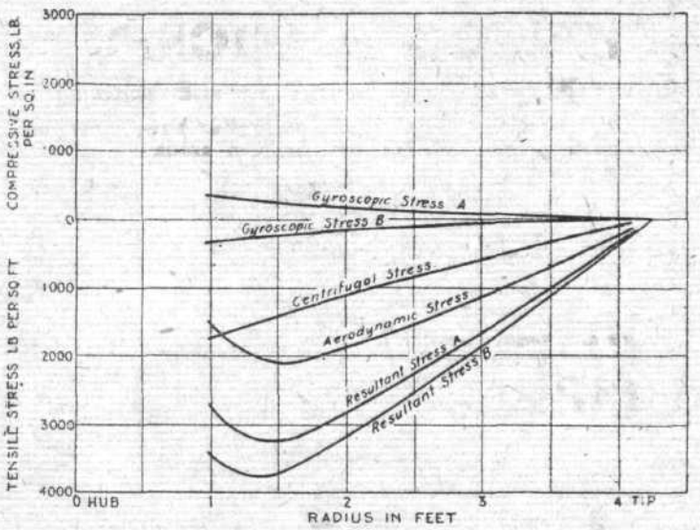


Fig. 15.—Stress in propeller blade at point C (see Fig. 12).

that is, as to the precession. There is some question as to the assumption it is reasonable to make in computing the stresses. The type of aeroplane, size and disposition of the larger masses, such as engines, &c., will affect the rate at which a machine can be turned in flight. In general, the angular velocity in yaw will not greatly exceed 0·35 radian per second. It must be remembered, however, that a steeply-banked turn also involves rotation in pitch. The maximum angular velocity attained in coming out of a steep dive can be estimated from the characteristics of the aeroplane and the factor of safety, which determine the maximum high speed attainable and the radius of curvature of the path along which it is possible to pull the machine out of its dive safely. A safe value for the angular velocity in pitch for the usual type of present-day aeroplanes is about 1 radian per second. Loops have been turned in about 6 secs., which gives about the value mentioned of the angular velocity. A precession of 1 radian per second at the normal speed of the engine should, therefore, be assumed in computing the stresses. The stresses set up by gyroscopic forces are alternating, changing in sign (tension to compression) twice in each revolution of the propeller about its axis. The fibre stress caused by the gyroscopic moments is given in Figs. 13, 14 and 15. Algebraically adding the fibre stress at the three points chosen gives the approximate value of the resultant fibre stress at those points, as shown in the same figures. It will be noticed that the maximum stresses occur at some distance out from the hub. To ensure a good wearing blade, which will stand up under the necessarily hard usage given it in the field, a factor of safety of not less than 5 is suggested as being the minimum consistent with requirements when the three principal stresses are taken into consideration.

Suggestions for Improvements in Design.

These suggestions on power plants are based on the experience of the First Aero Squadron, United States Army, in the field. It is considered extremely poor practice to use shims under the caps of crankpin and crankshaft bearings. Many American crank-cases are not sufficiently rigid in construction. It is believed that crank-case castings are not designed and built in this country with sufficient care. Some of the jigs for boring crankshaft and camshaft bearing seats are not so accurate as desirable. In some cases it has been found that pistons are not of uniform weight and are not carefully made. Lack of interchangeability of parts and careless workmanship have been great faults in this country.

Oiling system.—This should be by pressure to all important bearings, preferably from a gear pump. Screens should be provided to protect the suction pumps. For engines that have push-rod and rocker-arm valve mechanism, means should be provided to reduce the friction on the exhaust-valve rocker-arm bearing, especially if the valves are more than 1¼ ins. diameter.

Ignition.—All military aeroplanes, except possibly the pursuit type, should have two complete and independent ignition systems. Engines larger than 140 h.p. should have a booster system for starting on battery spark, if a starter is not provided. It is believed that our magnetos would have much longer life if a more suitable shock-absorbing device between the driving gear and the magneto shaft were provided. A magneto mounting should be machined so that the magneto shaft will be exactly in line with its driving shaft; dowel pins and dowel-pin holes to preserve this alignment should be provided. No shims should be used here. We have had considerable trouble because of non-uniform and warped carbon brushes.

Fuel supply.—Carburettors should be located in such a way that oil, water and impurities cannot enter them. They should be supported from the engine, and not from the framework of the aeroplane. They should be supported independently of the intake manifolds, if practicable. Gaskets for connections in intake manifolds should be as thin as practicable. Manifolds built of copper, brazed, or of steel, welded, are considered preferable to cast manifolds. Steel is considered preferable, but should, of course, be heat treated after welding. It is urged that more study and care should be put into the design relating to shape and finish of the interior of intake manifolds and passages. It is believed, in this connection, that much greater efficiency can be obtained by attention to fluid flow.

Cooling system.—Radiators should preferably be placed at the leading edge of the upper wing, the header being shaped so as to form part of this leading edge. If it is necessary to place the radiator between the engine and the propeller, the radiator should be circular. The radiator should be provided with a sufficient number of points of support to prevent deformation of the shell owing to shocks on landing. Care should be taken with the alignment of tubes at the connections in the water-circulating system. A ring reinforcement might be welded to a flanged end of the thin tubing and the face machined so as to make a good fit to the cylinder jacket. It is considered bad practice to expand thin tubing.

Air Work in Macedonia.

In spite of rain, mist and latterly snow, the British airmen on the Macedonian front have been very active, says the *Times* correspondent. Numerous successful raids have been carried out, and four enemy machines had been brought down since January 1st. Three of these were brought down by one officer. The observation officer on the third was Count Schwerin, who was taken prisoner.

SIDE-WINDS.

FULL of good things, to amuse and instruct, comes the first number of the *Olympian*, the Works Magazine of the Blackburn Aeroplane and Motor Co., Ltd., and all who have been concerned in the enterprise may well be proud of it. Unlike some house organs, every page of the *Olympian* is filled with matter of direct interest to Blackburn employees, and we fancy there will be few of the workers at Olympia, Leeds and the other Blackburn centres of activity who will not look forward to receiving their copy each month. Among the contents may be mentioned an excellent portrait of Mr. Robert Blackburn, the Managing Director, an informative chapter on aeroplane design, an article on Flight at High Altitudes by Mr. G. Thomson, which it is hoped will lead to

Some fashion suggestions for fair munitioneers, by A. E. Mills. (From the *Olympian*, the Blackburn Co.'s House Magazine.)

a good discussion, and a competition calling for an essay not exceeding 500 words on "Aircraft in 2000 A.D." Mr. Stuart Hirst, Chairman of the Company, is Editor-in-Chief of the *Olympian*, assisted by a committee of five.

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BY way of a little break in their labours, the staff and employees of the Navarro Aircraft Co., Ltd., at Burton-on-Trent, foregathered on February 1st at the invitation of Mr. and Mrs. Navarro for a Social. Mr. C. Nichols, the works manager, who had the organisation in hand, discovered a useful lot of musical and other talent among the staff, and with dancing and other items the evening went with a swing from start to finish. Among "other items" must be included a very practical address by Mr. J. G. Navarro, in which he said that in the few months the works had been in existence progress had been greater than they had expected. He hoped that each would continue to do his best for the firm, not that he wanted to get more work out of them, but that everything they turned out should be done well. He hoped that the number of employees would eventually be ten times what it was at present. In the course of a few months Mr. Navarro hopes to make the concern one of the staple industries of the town, and in a year or two one of the leading works of its kind in the country.

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THIS reminds us, too, that the Navarro Co. have issued a little booklet to their employees. It is entitled "Is there a chance for me?" and points out clearly that by doing his best for the firm each worker will be doing the best for himself, besides making himself—or herself—indispensable to and highly appreciated by the Navarro Aircraft Co., Ltd. By way of pointing the moral, Galahad's search for the Holy Grail is referred to, and the firm have adopted the motto "Be a Galahad."

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AMONGST recent subscribers to the War Loan are Brown Brothers, Ltd., and the Rotax Motor Accessories Co., Ltd., both of whom are putting in £20,000 of new money. The Lodge Sparking Plug Co., Ltd., have applied for £25,000, of which £20,000 is new money.

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THE Wells Flying School at Cobnor, near Chichester, has started operations, Mr. G. Virgilio, who is in charge, making the first flight there a few days ago on one of the 70 h.p. Gnome dual control school machines.

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MR. SYDNEY PICKLES, who has been enjoying a well-earned rest, and incidentally taking in a honeymoon at the same time, after his strenuous work of testing new machines, has now resumed activities, not, however, in the old capacity. By way of a change, he has decided to see how things aviatic look from the ground level, so to speak, and to this end has joined the Wells Aviation Co., of Chelsea, as technical adviser. In his capacity as test pilot, Pickles has had unique experience in the handling of a number of different machines, and he should therefore prove a valuable help to the Wells firm through being able to advise them on what his experience has taught him to be the best and that which is passing good in a machine, from a pilot's point of view as well as constructionally.

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ACCORDING to instructions from H.M. Government the whole output of the Lodge Sparking Plug factory has to be reserved for urgent national requirements. The Company regret, therefore, that in future they will only be able to supply Lodge plugs (except for export) to orders accompanied by Munitions of War Certificates, either Class A or Class B.

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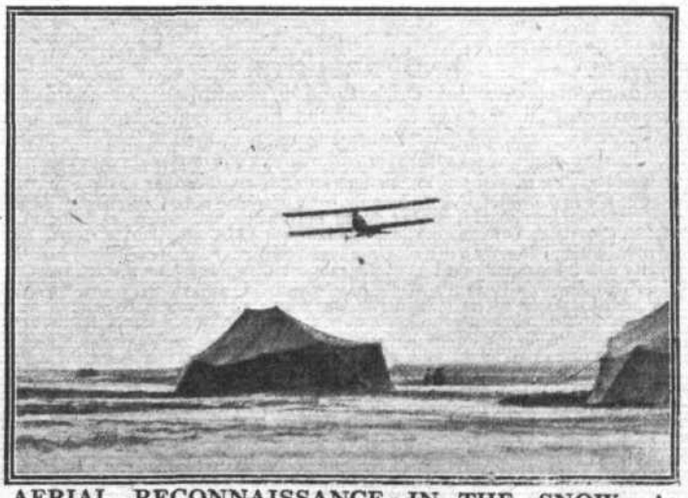
ANOTHER mem. In order to facilitate communication by telephone, the Aircraft Supplies Co., Ltd., have secured additional lines, but this has necessitated a change of number. In future, the call is Holborn 858.

The U.S.A. Rigid Dirigible.

IT has been announced in the United States that the construction of the large rigid dirigible which is to be built will be under the direction of a joint technical board, of which the Chief Constructor of the Navy will be the senior member, with three officers from the Navy and three officers from the Army. The scheme has been approved, and the cost of construction will be borne equally by the Army and the Navy. The official statement adds: "The importance of the rigid airship for military and naval purposes is fully realised, and it is believed that the problems involved can be worked out better, more rapidly and more economically by joint action than if each service took them up separately."

Long Flights by U.S. Army Aviators.

TWELVE aviators attached to the United States Army on December 30th set out from Mineola, L.I., to fly to the Philadelphia Navy Yard, and eight of them succeeded in covering the distance of 115 miles, the best time being made by Lieut. Coyle, who took 1 hr. 37 mins. The others who completed the journey were H. W. Blakeley, P. C. Millman, Capt. J. E. Carberry, Lieut. J. E. Miller, Lieut. G. Osborne, L. Bonney, Lieut. E. W. Bagnell. On the following day seven started to fly back to Mineola, and five got through. They were Lieut. Miller, Capt. Carberry, L. Bonney, W. H. Blakeley and Lieut. Coyle.



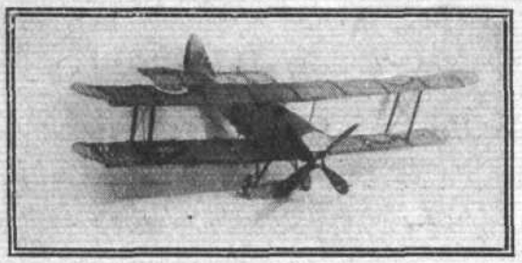
AERIAL RECONNAISSANCE IN THE SNOW.—A German Albatros off for a trip over the lines of the Allies.

MODELS.

A Flying Scale Model.

A WAKEFIELD reader, Mr. J. Frazer, who is trying to get into the Royal Flying Corps, in sending the accompanying photograph of a scale model he has made, says :—

"I did not intend it for a flying model, but when it was finished I thought I would see if it would fly, so tried it with eight strands of ¼ rubber. It just lifted itself off the ground.



A scale model which has flown.

The span is 2 ft. 9 ins. and the length is 2 ft. from rudder to propeller, the chord is 4½ ins. and the gap 4 ins. The four-bladed propeller is 6 ins. diameter and made out of walnut. I make all my own propellers."

[As this is the first scale model Mr. Frazer has made, he is to be congratulated on his success, and we shall hope to see some further results. Mr. Frazer had previously made a number of "flying stick" models.]

Some Queries and Replies.

MR. K. H. FORESTER, who asks for information *re* steam plant for models, would get a good deal of help from the articles on the subject by Mr. V. E. Johnson which appeared in "FLIGHT" for April 23rd and April 30th, 1915. A flash boiler is one consisting of a length of more or less small bore tubing which is heated by a burner, and through which tubing the water is instantly flashed into steam.

MR. S. NESBITT wishes to know if there is a model club in existence in Edinburgh, as he would like to join. With regard to parts and materials for model aeroplanes, he can hardly do better than write to Messrs. A. E. Jones, Ltd., 97, New Oxford Street, London, W.C., or Messrs. T. W. K. Clarke and Co., Ltd., Hampton Wick, Middlesex.

MR. G. F. PHILLIPS, who is thinking of building a model Zepp., should find the drawing of the "L. 33" in "FLIGHT" for October 26th sufficiently accurate to work from. To lift a weight of 1 lb. a gasbag holding more than 15 cubic ft. of hydrogen would be required.

THE notes on the foot-lbs. of energy storable in 1 lb. weight of rubber enquired for by Mr. H. G. Bundy, will be found in "FLIGHT" for February 17th, 1912. The article on the physical properties of a twisted skein of rubber appeared in our issues of September 28th and October 5th, 1912.

THERE are directions for building both model aeroplanes and airships in "Modern Models," by Mr. V. E. Johnson, which is published by Messrs. C. Arthur Pearson in their "How Does It Work Series." It can be obtained in paper covers for 1*s.*, or bound in cloth at 1*s.* 6*d.* Another useful book by the same author is "Flying and Some of Its Mysteries," published by Messrs. Hodder and Stoughton.

UNAFFILIATED MODEL CLUBS DIARY AND REPORTS.

Club reports of chief work done are published monthly. Secretaries' reports, to be included, must reach the Editor on the last Monday in each month.

Finsbury Park and District (66, SOUTHVIEW RD., HORNSEY).

Monthly Report.—Owing to the unfavourable weather that has prevailed during the last month, flying has only been possible on two occasions. On Jan. 6th the best flights were made by the tractor monoplane belonging to Mr. E. Coleman. On one occasion, fitted with a 13-in. propeller, it rose to a great height and flew for a distance of about 600 yards. No trace of its whereabouts could be found until the following morning owing to the darkness. Mr. F. E. Rayner's large 4-ft. model has been fitted with a larger plane, which has added greatly to its efficiency. On nearly all occasions it flew about 500 yards. Two models were flown very successfully by Messrs. A. Richards and C. J. Burchell, the former doing good durations. R. E. Stansell, a junior member, flew a small model well. On Feb. 3rd the same members were out and the same models were flying, with the addition of a very fine monoplane by Mr. Burchell. It was fitted with a 4-ft. plane and a 14-in. propeller. No nails whatever were used in the construction of the former, the ribs being attached to the main spars by small aluminium clips. This model was a very steady flyer and remarkably slow. During the afternoon many long and high flights were made by the various models with good durations. In the evening the club held a meeting at the house of Mr. Burchell, and several resolutions were carried respecting the subscriptions and competitions for this year. The balance sheet and a report on the last year's work were read and approved. Until the end of the war it was decided to hold only very few competitions, and instead of cash prizes certificates of merit will be awarded, and the member who holds the highest average for the year earns the special yearly certificate.

NOTICE.

Subscription Rates.

IN consequence of the present British postal rates for newspapers, the Publishers of "FLIGHT" have been compelled to revise the subscription rates, which are now as follows :—

	s.	d.
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Three months, post free	2	2
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OTHER PLACES ABROAD.		
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PUBLICATIONS RECEIVED.

High-Speed Internal-Combustion Engines. By Arthur W. Judge, A.R.C.Sc. London: Whittaker and Co. Price 15*s.* net.

Report of the War Refugees Committee. The War Refugees Committee, General Buildings, Aldwych, W.C.

Poland for the Poles. London: George Allen and Unwin, Ltd., 40, Museum Street, W.C. Price, 3*d.* net.

NEW COMPANIES REGISTERED.

FURLONGS, LTD., 115, Powis Street, Woolwich.—Capital £30,000, in £1 shares. Acquiring the business carried on at Woolwich as "Furlongs," carriers by land, air and water, cartage and general contractors, &c. First directors: E. Furlong, H. J. Furlong and F. O. Furlong.

PATEY AND CO., LTD., 4, Great Marlborough Street, S.W.—Capital £3,000, in £1 shares (1,000 7 per cent. non-cum. preference). Manufacturers of and designers of aeroplanes, airships, automobiles, &c. Under agreement with E. Patey, H. P. Patten, A. R. Beeby and H. L. Milner.

Aeronautical Patents Published.

Applied for in 1915.

Published February 8th, 1917.

17,850. P. CARCANO. Flying machines.

Applied for in 1916.

The numbers in brackets are those under which the specifications will be printed and abridged, &c.

Published February 8th, 1917.

206. A. L. DENPHY. Anti-aircraft guns. (103,131.)

780. SUNBEAM MOTOR CAR CO. AND L. COATALEN. Crank chambers for aviation engines. (103,159.)

7,008. J. T. PARKER. Armoured aeroplanes. (103,242.)

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